Report No. 13847-KO

Korea
Transport Sector
Resource Mobilization Challenges and Opportunities

April 3, 1995

East Asia and Pacific Region
Country Department I
Infrastructure Operations Division

Document of the World Bank

CURRENCY EQUIVALENTS
(as of June 10, 1994)

Currency Unit	=	Won
US$1.00	=	W800

MEASURES AND EQUIVALENTS

1 meter (m)	=	3.2808 feet (ft)
1 square meter (sq m)	=	10.7639 square feet (sq ft)
1 kilometer (km)	=	0.62 mile (mi)
1 square kilometer (sq km)	=	0.3861 square mile (sq mi)

ABBREVIATIONS AND ACRONYMS

AAR	=	Asiana Air
ALS	=	Area Licensing Scheme
BF	=	Backstop Facility
BOT	=	Build-Operate-Transfer
CBD	=	Central Business District
CPI	=	Consumer Price Index
DBOT	=	Design-Build-Operate-Transfer
GRT	=	Gross Registered Tonnage
HC	=	Hydro Carbon
HOV	=	High Occupancy Vehicle
HSR	=	High Speed Rail
IATA	=	International Air Transportation Association
IC	=	Interchange Cost(s)
KAA	=	Korea Airport(s) Authority
KAL	=	Korean Air Lines
KCTA	=	Korea Container Terminal Authority
KHC	=	Korea Highway Corporation
KHRIS	=	Korea Research Institute for Human Settlements
KLDC	=	Korea Land Development Corporation
KMPA	=	Korea Maritime and Port Administration
KNR	=	Korean National Railroad
KOTI	=	Korea Transport Institute
LRMRC	=	Long-Run Marginal Road Costs
MFE	=	Ministry of Finance and Economy
MOCT	=	Ministry of Construction and Transport
NFYEP	=	New Five-Year Economic Plan
NSMA	=	New Seoul Metropolitan Airport
OECD	=	Organization for Economic Cooperation and Development
PECT	=	Pusan East Container Terminal Company
PSO	=	Public Service Obligation
PUTA	=	Pusan Urban Transit Authority
SDI	=	Seoul Development Institute
SOC	=	Social Overhead Capital
TEU	=	Twenty-foot Equivalent Unit
TSM	=	Transportation System Management

FISCAL YEAR

January 1 to December 31

Acknowledgement

This report is based on the findings of a Bank mission to Korea in February 1994, comprised of Messrs./Mmes. Jitendra N. Bajpai (Task Manager, EA1IN), Lance Morrell (EA1IN), Sudhir Shetty (EA1C1), Kenneth Gwilliam (TWUTD), Jae So (PSD), Soo-Man Chang (Seconded to the Bank from the former EPB, Korea) and consultants Joseph S. Revis, Jeffrey A. Parker and Stein Hansen. The report benefited from the background data provided by E. Shon, counter-part team leader from KOTI and his team members representing various divisions of KOTI, KNR, KHC, KTI, KRIHS, KHSRCA, KMI, and KATRI. The administrative and logistical services organized by MOCT and KOTI are gratefully acknowledged. Professors Tae H. Oum and William G. Waters contributed to the preparation of the final report and offered valuable suggestions. Suzanne Holste (Analyst, TWUTD) assisted with the data processing. The report was reviewed by Robin Carruthers (LA2IN) and Neil Rogers (PSD), edited by Ms. Barbara Koeppel and produced by Ms. Bobbie Brown with assistance from Ms. Eva Monteblanco.

KOREA TRANSPORT SECTOR REVIEW

RESOURCE MOBILIZATION CHALLENGES AND OPPORTUNITIES

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IBRD Map No. 24232R

EXECUTIVE SUMMARY

1. The transformation of the Korean economy is recognized throughout the world. Over the past two decades, per capita income levels grew substantially and now exceed US$6,500. The country achieved extremely rapid economic growth, averaging almost 9% a year since 1980, and freight and passenger traffic increased even more rapidly. To respond, Korea developed a multi-modal transport network within the confines imposed by the country's mountainous terrain.

2. In the past, Korean transport policy was designed to expand capacity while retaining regulatory controls to limit price increases and provide some direction for the industry. Although substantial public investments created additional capacity to ease bottlenecks in rail, roads, ports, aviation and urban transport, demand continues to seriously outstrip capacity (under the present regulatory and pricing environment and the current pace of economic growth); and all modes are showing location and time-specific signs of congestion. For example, peak period traffic congestion in large urban areas, particularly in Seoul and Pusan, has severely affected the economic life of these cities. Similarly, most modes are operating at or above capacity along the Seoul-Pusan corridor, a dominant axis that links most large cities.

3. Until recently, the major challenge in transport was building infrastructure to facilitate development while controlling it either through direct ownership and operation by Government agencies or by regulatory controls on private operators. Overlaying this was a macroeconomic policy to limit inflationary pressures. While one could debate elements of the strategy, it appears to have worked, at least until recently. However, the experience of the last few years reveals a need for re-assessment. Pressure still exists to expand infrastructure, but increasingly Korea will need to balance supply and demand, as well as to facilitate the flow of capital for social overhead investments.

4. Under the Seventh Plan (1993-97), Korea intends to invest almost US$45 billion in inter-urban transport (about 40% in several mega-projects such as the Pusan-Seoul High Speed Rail System), and about US$25 billion in six urban rail transit systems (to be completed by 2001). Mobilizing the necessary resources will be a major challenge, since present pricing structures and Government financing will not be sufficient. Creative solutions to fund new investments and greater scrutiny of funding trade-offs have become critical.

5. The transport problem is not one of underutilization or one of poor performance in terms of service quality. Rather, Korea's challenge is to increase reliance on market mechanisms to address the need for additional resource mobilization and improved management of demands across modes. A combined strategy of capacity increase and demand management seems appropriate given that there is a limit to which a supply-oriented strategy can be pursued to meet the rapid growth in demand at a sustainable level. Transport pricing has yet to be fully appreciated as a means for demand control, improved cost recovery, and the efficient utilization of transport facilities. However, if current prices reflect the true cost of services, charges will (a) generate additional revenues, (b) move riders/freight to the most efficient modes and (c) help decision-makers determine where resources should be invested. Reducing price distortions will also encourage the private sector to invest in the modes that sustain development at the lowest social cost (which includes externalities, such as vehicular pollution).

6. The growth of Korean markets has brought a proliferation of products, services, freight movements and travel, which means that centralized controls needed to be scaled back and concentrated on fewer strategic choices. As a result, authorities moved to decentralize many Government decisions as well as allow transport users to play a greater role in influencing what facilities and services are provided and who is to pay for them. Korea is already taking steps in these directions by corporatizing former Government departments and agencies, and expanding private participation. The report builds on this momentum, offers suggestions about policy directions and discusses how added transportation challenges can be met.

7. In sum, Korea must find ways to finance needed infrastructure investments and to identify measures that can improve performance and use of existing transport capacity. These provide the issues around which this study is conducted.

8. The study's objectives are:

(a) To review the state of transport in Korea and its future direction in terms of performance, priorities and balancing of modal investments and institutional policies;

(b) To assess the near-term financial resource requirements and constraints;

(c) To examine options for pricing and regulatory reform in the various transport markets to improve performance;

(d) To identify innovative public and private financing options.

Transport Trends, Modal Shares and Performance

9. Demand has been growing rapidly for most modes, dramatically for some (see Table S-1). Trucking is the dominant freight mode, especially in the private or unregulated sector. As development occurred, a greater variety of goods became time-sensitive. Because rail and coastal shipping are less suitable to time-sensitive movements, they have played a reduced role hauling low-valued bulk commodities for longer distances. This is consistent with the pattern in most other industrialized countries.

10. The road sector represents the largest share of passenger movements, as rapid motorization is linked with the easing of constraints on auto ownership, particularly rising income and availability of locally manufactured vehicles. Automobile registration increased more than nine-fold from 1983-93, an unparalleled growth (78 veh./1,000 pop. in 1991). A high level of automobile growth is forecast to continue; hence the importance of planning and investing in roads *and* mass transit to cope with rising demands.

11. Other sub-sectors have also changed rapidly. In primary inter-urban markets, aviation is ever more important: Domestic air travel grew more than five-fold over the last 10 years (although aviation holds a small share of total traffic relative to other modes). Also, as the use of the private automobile expanded, shares of bus and inter-urban rail decreased substantially.

12. In urban transport, private buses still dominate, but the rail/subway share rose sharply where these were available (see Table S-2). For their part, taxis are more important in Korean cities than in cities in most countries.

Table S-1: Korean Domestic Transport Modal Shares

Modal Share (percent)

	Year	Rail		Highway				Coastal Maritime		Aviation	
				Commercial		Noncommercial					
		Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km
Freight	1981	12.14	37.51	25.90	16.88	56.37	18.00	5.52	27.49	0.00	0.02
	1992	3.50	15.80	15.82	12.59	75.57	31.63	5.11	39.87	0.01	0.10

	Year	Inter city Rail		Subway		Highway				Coastal Maritime		Aviation	
						Commercial		Noncommercial					
		Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km
Passenger	1981	4.31	22.38	0.86	1.31	84.25	69.96	10.48	5.28	0.09	0.50	0.02	0.58
	1992	2.87	18.98	5.45	7.08	51.52	45.37	40.07	25.42	0.03	0.29	0.06	2.86

Source: Chapter II, Tables 2-1 and 2-3.

Table S-2: Recent Modal Shares in Large Cities

City	Modal split (%)				
	Car	Bus	Taxi	Metro	Other
Seoul (Peak hr.)	14.2	38.4	12.1	25.0	10.3
Pusan (Peak hr.)	12.9	45.5	21.5	9.0	11.1
London (1986)	61.0	23.0	1.0	12.0	2.0
Paris	65.5	10.6	--	19.9	4.0
Tokyo	17.5	5.7	4.9	71.4	--

13. For all modes, in both urban and inter-urban markets, congestion is heavy, particularly during peak periods, with the infrastructure strained along major inter-urban corridors and in large urban areas (see Chapter II). Almost 42% of vehicles are concentrated in Seoul (34%) and Pusan (8%). In Seoul, the average automobile speed is about 20 kph, and only 8 kph in the inner-city during peak hours, while it is about 30 kph in Singapore, 15 kph in Tokyo and Jakarta, 10 kph in Manila and 9 kph in Bangkok central areas. Along the Seoul-Pusan rail line, 136 trains operate daily in each direction, and the line's capacity is 138 trains per day. Despite large investments in roads, the congested section of expressways and national roads have increased from 814 kms in 1988 to 3,880 kms in 1992. Three major ports accounting for 80% of the total waiting hours (Inchon, Pusan and Kunsan) are showing signs of congestion leading to an estimated W70 billion of economic losses in delayed ship time in 1990.

Transport Investment and Economic Growth

14. It is widely-held in Korea that there was substantial under-investment in social infrastructure during the past decade. This view derives partly from the reduced investment in "social infrastructure," including transport, at the expense of manufacturing. However, despite this shift in sectoral shares, a much higher share of GDP has gone towards investment during the past decade (as a share of GDP, gross capital formation increased by almost 4% during 1980-92). Hence, the decrease in the share of transport investment since the early 1980s is far smaller (about 0.3% of GDP) than usually assumed. Moreover, economic returns on the incremental manufacturing sector investment that occurred in the 1980s appears to have been extremely high.

15. Investment in transport has been undertaken almost exclusively by the central and local governments or by public corporations; but there has been a continuous shift in expenditure shares during the last decade away from the central and towards local governments and public corporations (Table S-3). This shift reflects the growing role of the Korean National Railroad (KNR) and Korea Land Development Corporation (KLDC) in financing rail investments for the new townships, an enormous increase in borrowing by the Korea Highway Corporation (KHC) and the expansion of local government financing of roads and subways. Among modes, investment in roads has remained dominant, whereas the shares for ports and rail declined during the last decade (Table S-3). Investment in subways fluctuated during the period, rising recently with the construction of new lines.

Table S-3: Korea: Investment in Transport Infrastructure by Source
(Percent of total investment; current prices)

Source	1980	1985	1986-90	1991
Central Government	73.1	61.0	55.4	33.4
of which: Road (Motorways and Trunk Roads)	20.8	26.9	30.8	21.5
Rail	27.1	10.5	7.6	4.8
Port and Airport	20.0	12.9	10.8	4.7
Subway	5.2	10.7	6.3	2.4
Local Government	22.7	31.5	34.2	46.7
of which: Road (Local including Metropolitan roads)	22.7	25.2	27.1	35.0
Subway	-	6.3	7.1	11.7
Other (including Public Corporations)	4.2	7.5	10.4	19.9
of which: KHC (Roads)	3.4	3.4	5.5	9.4
KMPA, KAA, and Private (Ports and Airports)	0.8	1.2	1.1	1.3
KNR and KLDC (Rail)	-	2.9	3.7	9.1
Total (billion Won)	580.7	1604.8	12893.1	5747.6

Source: Table 2-22.

16. Those who argue that Korea has under-invested in transport infrastructure also point to recent evidence from the U.S. and other Organization for Economic Cooperation and Development (OECD) economies, which shows high rates of return to public investment in such facilities. However, there remain serious doubts on both theoretical and empirical grounds as to the validity of these results and their interpretation. In particular, recent studies find rates of return on these projects to be no higher than for private non-infrastructure investment, while unresolved methodological issues cast doubt on the robustness of these estimates. Thus, considerable caution is warranted before concluding that large investments in transport infrastructure would automatically accelerate economic growth. As always, investment plans should be drawn up by subjecting individual projects to detailed cost-benefit analyses. Finally, the level of past infrastructure investment in Korea (2%-3% of GDP) does not appear inadequate when compared to Japan (when it was at a similar level of development) and Taiwan (China).

Resource Requirements and Financing Constraints

17. According to the New Five Year Economic Plan (NFYEP) (1993-97), transport infrastructure investment is projected to increase from 3.9% to 5.9% of GDP[1], averaging over 5% during the plan period (Figure S-1). The scale of the proposed increase can be seen when it is compared to the average of 2.4% of GDP during 1983-92. While the largest share of expenditures will continue to be on roads in general, the shift is towards local roads. Rail and subway investments are also scheduled for major increases occurring at the expense of port investments (see Figure S-2 for the projected shares of sector investments). About 40% of total infrastructure spending will be directed to a limited number of mega-projects, including the new Seoul International Airport, urban subways, the Seoul-Pusan high speed rail project, and expressways.

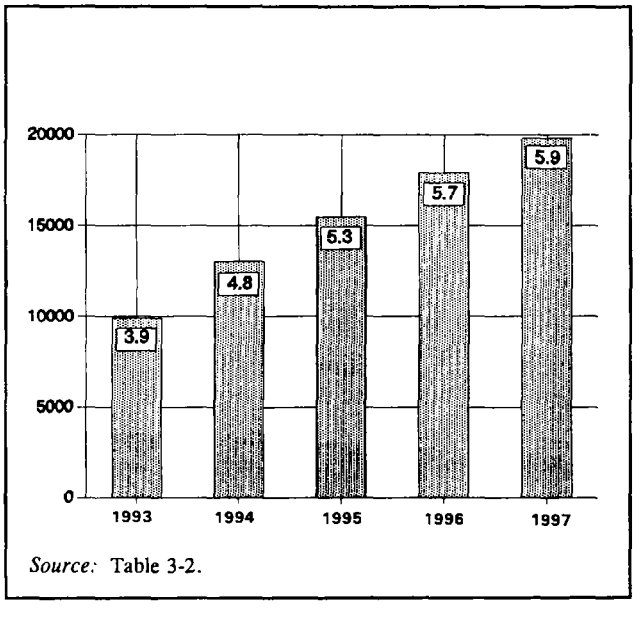

Figure S-1: Projected Transport Infrastructure Investment (figure in box is percent of GDP)

18. Although the plan identifies the sources of financing for these investments, these estimates are not intended to be precise commitments. It is anticipated that the shares of central and local government will be about equal, with the balance (16%) from public corporations (see Figure S-3). For the central government, earmarked motor vehicle-related taxes would provide around 24% of the total investment, which is roughly similar to their contribution in 1988-92. However, the share of these taxes in GDP would average about 1.5%,

[1] There is still uncertainty as to the precise magnitude of this proposed investment program. During discussions of this report with Government, it was noted that total investment in transport infrastructure during 1993-97 was projected to be about W48 trillion rather than W76 trillion. However, it was later clarified that this lower estimate excluded investment in local roads. Irrespective of the precise magnitude of proposed investments, the macroeconomic considerations discussed here are still relevant, given the pressures that exist in Korea to expand transport investments.

which is more than double the average level in 1988-92. At the local level, the share of motor vehicle-related tax revenues to total transport investments is projected to be about 19% over the plan period, rising relative to GDP from 0.6% in 1988-92 to 1.1% in 1997. In terms of municipal expenditures, transport investments will absorb about 11% of total expenditures over the next five years, compared to an average of 6.8% between 1983-91.

19. Though the contribution of major public corporations to total investment is slated to increase from over 11% during 1986-90 to almost 17% over the plan period, their ability to finance investments on this scale is doubtful. KHC and the subway corporations of Seoul and Pusan have accumulated substantial debt over the past years, and their debt service expenses now exceed net operating revenues by a large margin, debt service also consumes a substantial share of capital funding. Other public corporations such as KNR have self-sustaining operations, but their ability to finance major capital projects is limited under existing price regulations. The Government is examining options for mobilizing additional resources, including through private sector participation. The proposed privatization structure remains heavily weighted toward the use of real estate profits to cross-subsidize transport investment. Given historical experience, it is unclear how much additional resources will be generated. The ability to attract meaningful levels of private investment will depend on the extent to which transport pricing and the financial sector are reformed.

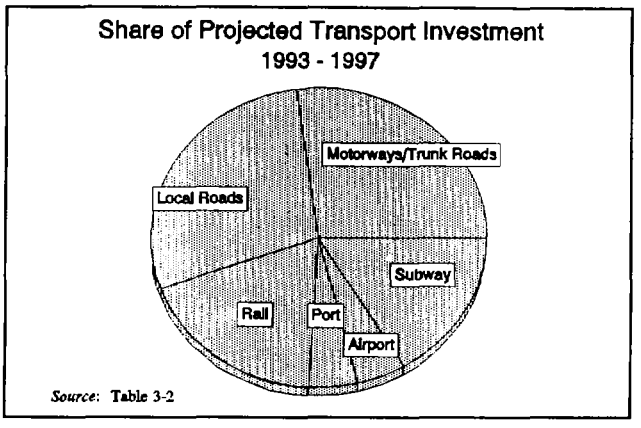

Figure S-2: Mode Shares of Projected Transport Infrastructure Investment

20. This assessment of financing sources shows a substantial gap between the planned investments and the funds available from transport-specific taxes and revenues of public corporations (if current prices are maintained). While there are no inherent problems with financing the residual investment program through general taxes if the investment program itself consists of projects with acceptable rates of return, the existence of a gap of this magnitude (about W30-35 trillion or 2%-3% of GDP), raises issues for macro-economic management. Specifically, if this gap is to be financed from general revenues, aggregate expenditures need to be reduced elsewhere in the economy if the risks of the economy overheating are not to be exacerbated. However, tradeoffs arise when achieving shifts in expenditure of this magnitude in such a short time. Reducing private consumption may be difficult because it has historically been compressed with high savings rates (over 30%). And, returns to public investments in other areas remain high. Financing the gap by expanding public sector borrowing domestically would raise interest rates and crowd out private manufacturing investment, which also has high rates of return. Further, while borrowing abroad to finance these investments has the advantage of not requiring a contraction of domestic expenditures, it could imply a real appreciation of the won or have adverse fiscal impacts because of the need to sterilize the capital inflows.

21. Implementing these options is feasible in light of Korea's historically sound macroeconomic management. Further, such a shift in expenditures would be desirable if it could be demonstrated clearly that the proposed transport investments provide higher rates of return than

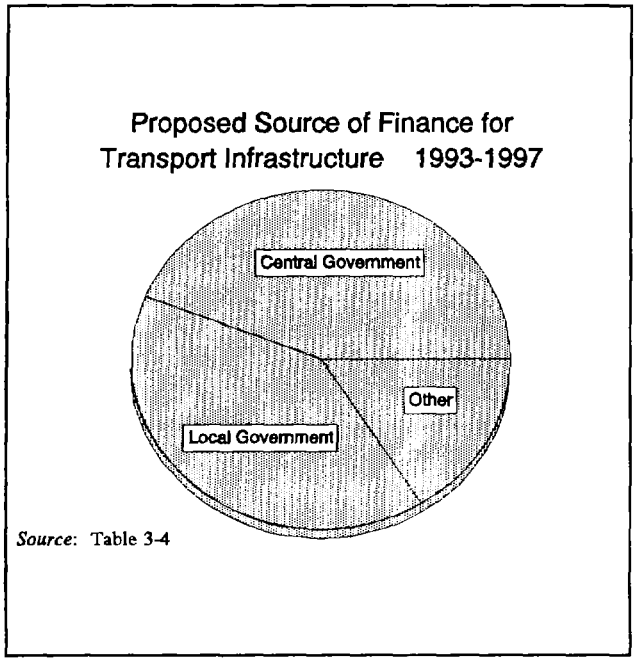

Figure S-3: Planned Shares of Government Finance for Infrastructure

the alternatives. However, each of the options has associated political costs which make them unattractive to policymakers. Hence, there may be an attempt to increase transport investments, as envisaged in the plan, without correspondingly reducing aggregate expenditures elsewhere in the economy. This outcome would mean a corresponding expansion of the current account deficit and inflationary pressures because the economy is already operating at close to capacity. In this respect, the experience of 1990-91 would likely be repeated with the cost being borne later in terms of lower growth rates when macroeconomic policies are eventually tightened. The costs to the economy would be obviously higher if the transport projects that are implemented are themselves driven by political, rather than rate of return considerations.

22. To reduce these risks, the report recommends a two-pronged approach. First, the pace of investment in transport infrastructure should be slowed from that proposed in the plan. Second, taxes on the transport sector and the price of transport services should be increased. This approach is preferable to the current investment-led approach for several reasons. It is more likely to be compatible with macroeconomic stability. Increasing the share of transport sector investment more gradually would be easier to accomplish because less resources need to be shifted away from other components of aggregate expenditures. And, raising taxes and the price on transport services would mean that a smaller amount would need to be funded from general revenues. For both these reasons, the risks of inflation and a wider current account gap would be reduced. A more gradual increase in investment would yield the added benefit of allowing closer scrutiny of the viability of individual investment projects, particularly the mega-projects. Finally, higher prices and taxes in the transport sector would increase efficiency by pricing services closer to the costs of provision. Such an adjustment would reduce demand, thereby also decreasing the need for additional investment.

Pricing and Regulatory Reforms

23. Current prices on various modes and markets are not closely related to the costs involved. Tariffs have been kept artificially low as part of an anti-inflationary policy and cross-subsidies used to offset the resulting imbalances. As a result, transport prices per se have risen more slowly than inflation. For instance, between 1980-90, the real price of gasoline, tolls and urban transit modes, other than subways, consistently declined (Table S-4). Low prices are causing financial shortfalls for transport agencies and carriers, and forcing private operators to curtail quality or break current regulations to survive financially. The regulated prices tend to stimulate additional travel demand and cause misallocation of travel among modes, routes and times of day, while not raising enough funds for needed investments.

24. These policies, while perhaps necessary during Korea's earlier development, are increasingly inconsistent. Incomes have risen, industrialization has occurred, producer and consumer goods are proliferating, and all these phenomena place diverse demands on the transport system. A more complex economy now needs to rely more heavily on market mechanisms to function efficiently. However, it should be recognized that the market cannot solve all resource allocation problems, particularly in dealing with externalities such as congestion and environmental degradation. Hence, Government intervention would be required in such areas including the "fine tuning" of user tariffs and taxes to reflect the externalities, and to encourage environmentally desirable practices, particularly in the choice of fuels and modes.

Table S-4: Trends in Real Prices for Transport in Korea
(1980 = 100)

Year	Gasoline	Diesel	Tolls	Bus			Subway	Small Taxi	Rail First	Air
				Standing	Seat	Freeway				
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.00	100.0	100.0	100.0
1985	68.8	91.4	95.8	94.6	82.7	89.9	150.70	86.6	91.9	104.8
1990	29.9	46.1	81.2	87.7	82.6	67.1	136.20	76.6	81.2	94.4
1991	34.9	42.1	99.5	94.0	77.9	74.2	155.50	78.2	74.2	86.2
1994	43.3	57.6	88.5	189.2	104.4	123.8	203.07	104.4	169.9	103.5

Source: KOTI, 1994.

25. Transport pricing and regulatory reforms should thus aim to:

(a) Ease control over transport prices (as anti-inflation policy);

(b) Encourage cost- and demand-based pricing policies;

(c) Promote more competition;

(d) Further the Government's decentralization policy, including corporatization where possible;

(e) Coordinate inter-modal relationships more effectively.

26. **Easing Control over Transport Prices.** The Ministry of Finance and Economy (MFE) controls on user charges for infrastructure should be eased. The MFE and leading agencies should play important roles in implementing and monitoring the Government's strategic resource allocation decisions, but they should avoid interfering with individual pricing decisions. Further, the current anti-inflationary price control policy is widely recognized as one that attacks the symptoms rather than the causes: Short-term gains are more than offset by the distortions caused by suppressing prices and cross-subsidization. Under the conditions of demand pressures as observed in the urban context, price controls on public transport (particularly buses) often depress service supply and increase demand for more expensive modes such as cars, premium bus services (seat buses) and taxis. Similarly, underpricing transport services tends to worsen congestion and thus raise the implicit prices of transport services (including congestion costs) above the controlled level and the

need for additional investments. The functioning of a market economy and the myriad investment and resource allocation decisions require that prices of all sectors be able to reflect changes in the costs of doing business.

27. **Encouraging Cost- and Demand-Based Pricing Policies.** Price distortions are not solely due to anti-inflation policies. This report cites examples from urban (Chapter IV) and inter-urban (Chapter V) markets where prices are neither cost-based nor designed to manage excessive transport demands. Most have evolved over time in an arbitrary fashion, and in many instances, capital costs are not fully accounted. Most agencies allow for depreciation of capital investments financed internally, but exclude interest payments and capital provided by Government grants or loans.

28. In general, highway user charges in Korea consist primarily of gasoline, diesel and excise taxes as well as tolls -- all set with a limited relationship to costs or market demand. The reasons are unclear (other than subsidy to truckers) for the wide difference between taxes imposed on diesel and gas. This price differential needs to be reduced and road user charges brought in line with road damage costs. In this respect, the New Zealand structure of graduated weight-distance based road use charges (see Box 5.1) should be investigated. Besides providing additional resources, the use of differential expressway toll rates designed to reflect distance, congestion and highway wear imposed by each vehicle type would contribute to a more efficient use of expressway capacity. Efficient decisions on private transport will only occur when all the costs imposed by modes using public infrastructure are reflected in the charges made directly and perceived immediately by users.

29. Cost recovery is not always an appropriate goal because, where infrastructure has unused capacity and the strategic interest supports mode-shifting (e.g., from cars to public transport), low prices could stimulate utilization of a mode. However, the opposite--high prices to ration excess demand and/or capture the economic costs imposed on society--is appropriate for congested facilities as in Korea. Despite extensive congestion in various transport sectors, peak load surcharges are almost unknown in Korea. However, congestion pricing could both reduce levels of excess demand and generate substantial revenue for recovering costs and financing further expansion. Increasing charges for the use of congested road space (e.g., cordon/point/time based pricing and/or location- and time- specific parking charges) is extremely beneficial in urban areas so the growing demand for infrastructure can be reconciled with limited public financing capacity, and at the same time increase the efficiency of current capacity (see Chapter IV, paras. 4.74-4.94). Even for air services, where demand may not be sensitive to high user charges during peak periods, such pricing should benefit airports and society by allocating the scarce capacity to high value users.

30. In the case of urban subways, where scale economies are not significant in the short run and peak capacity is fully utilized as seen in Seoul and Pusan, the long-run marginal cost (including the incremental capacity costs) become relevant for pricing decisions. Since Korean subways have been self-sustaining in terms of recovering direct operating expenses from internally-generated revenues (a rare feat internationally), the pricing policy must maintain this while subway prices are brought near to the marginal social costs of car use (including externalities). Capital subsidy for subways can be justified where user fees/taxes on auto use do not cover full costs (as is true in urban areas). In other words, where there are severe environmental impacts of one or more modes, the correct inducements may require either first best (pollution tax) or second best (countervailing subsidy) price adjustments.

31. Finally, there is an immediate need to replace the widely used average pricing system for each mode with the concept of differential pricing, in other words, pricing that better reflects the full, relative costs of various services, facilities and transport modes. At present, prices are kept uniform throughout the country for most transport modes with limited relation to the market conditions. However, besides enhancing cost recovery, a market-differentiated pricing would also encourage more efficient coordination and allocation of traffic between modes. In this regard, the most serious anomaly is the price of car use relative to public transport modes. Considering the gasoline price trend and an absence of road congestion charges, the price of auto use has fallen dramatically relative to the price of public transport in the past (Table S-4). Provision of free parking by employers and lower public parking charges compared to private charges (in many cases public parking does not reflect full costs, including land) further reduce the costs of auto use; such trends do not encourage travellers to switch to public transport or use autos less. The phenomenon of traffic balancing among modes will be more visible in congested cities and inter-urban corridors like Seoul-Pusan. For example, cost-oriented tariffs of all competing modes will permit domestic airlines to raise fares and become profitable. Thus, these would eliminate the cross-subsidization of domestic operations from international traffic.

32. A key way to effect price reform is to increase accountability and market responsiveness of transport agencies--relaxing restrictions and giving more freedom and responsibility to transport operators. Some conditions, however, require increased Government action: public safety, pollution and congestion call for intervention and coordinated policies such as congestion pricing and fuel pricing. This can be done at local/regional levels but requires Government approval and support.

33. **Promoting Competition.** Myriad controls on entry, operating rights and price/service restrictions, however well-intentioned, interfere with efficient operations. A good example of the costs of regulatory restrictions can be seen in the trucking industry, which has encouraged expensive commercial operations over private trucks. Since new truck licenses have been limited, a significant volume of "illegal" truckers are in the market, linked to commercial companies. The dominance of non-commercial trucking is testimony to the inefficiencies resulting from current regulation of commercial trucking (see Chapter V, paras. 5.3-5.39). Thus, this report stresses reducing regulatory control over much of the transport system, in particular the motor carrier sector, but also bus services and domestic aviation. Many rail services can be competitive as well.

34. Regulations can also interfere with the price-quality options available to transport users. For example, those that restrict bus and taxi charges lead operators to cut quality and frequency of service to remain financially viable. Conversely, greater reliance on the market would permit a wider range of prices, services and more innovations in service delivery by commercial operators. In recent years, flexibility in application of policy has permitted the introduction of premium buses and deluxe taxis. It has allowed fares to rise and hence enabled companies to maintain a higher level of service than would have been possible at the usual price-quality option.

35. For some years, developed countries have moved away from the system of quantity licensing as practiced in Korea, such as restricting entry through route assignments, fleet size and type/size of vehicles and instead emphasized the quality aspects, such as safety concerns (tests of personnel, size and weight of vehicles to protect a facility), automotive emission standards, minimal financial requirements, and legal fitness (liability insurance). Thus, entry, price and service area/type regulations should be liberalized to allow more reliance on competition and market forces,

with Government interventions limited to quality, environment and safety, and possibly social consideration in a few markets (such as bus services to remote areas or poor neighborhoods, airports or ports in some locations). Even social objectives can be attained more efficiently by contracting competitively with private firms to deliver mandated services rather than attempting to implement such policies via restrictive regulations and cross subsidies.

36. Recognizing the close inter-relationship between entry restrictions and pricing, and the impact of price and service changes on modal competition, regulatory reforms should be implemented in a coordinated fashion to maintain a competitive environment in each market. Fewer restrictions on pricing and entry would lead to the establishment of competitive prices for transport services, thereby improving financial performance and utilization of modes as well as restraining the growth of travel stimulated by artificially low fares. Moreover, the Government should recognize that other restrictions inhibiting private participation in the sector need to be eased besides freeing pricing for attracting private financing in the sector.

37. **Furthering Decentralization and Corporatization.** The Government recognizes that while it retains influence over national policy, some decisions are best made at lower levels. For example, jurisdiction over urban bus and taxi pricing is being delegated to local governments and many other urban investment decisions could be made by those closest to the problems and accountable to the people most affected. Currently, the main exception is subway pricing, which has not yet been delegated to local levels. Without jurisdiction at the local level over all modes, it is very difficult to implement a multi-modal planning framework that would integrate various urban transport modes, and regionally coordinate the prices of subways, buses, taxis, tolls, parking and congestion charges.

38. Until now, public corporations have had little freedom to pursue their mandates. However, the Government has taken steps to grant greater autonomy, which will bring greater orientation to costs and market conditions. Korea Maritime and Port Administration (KMPA) and the other port corporations (e.g., Korea Container Terminal Authority (KCTA)) have achieved greater autonomy, but it is not complete, while Korea Airport Authority (KAA) and KHC have only limited independence. KNR is scheduled for corporatization in 1996: Its reorganization would be more consistent with the best managerial practices elsewhere.

39. Mechanisms for targeted public subsidies have to be developed in cases where Government wishes to pursue specific social objectives. For instance, the present policy of subsidizing third and fourth class rail passenger service raises the need for using the public service obligation (PSO) concept for KNR after its corporatization in 1996. PSO allows transport and non-transport costs to be segregated (where subsidies are involved), and thus makes the payments open to review. It also reinforces commercial practices within a newly corporatized entity.

40. With regard to air transport, the various revenue-generating tasks of airports lend themselves to divestiture and corporatization. KAA, the Ministry of Construction and Transportation (MOCT) or the military could retain ownership of land and perhaps buildings, but a number of unrelated activities could be unbundled. Such services could be provided by private corporations based on an open competitive tender, or KAA could corporatize several of its functions. It would seem possible to establish autonomous corporations responsible for operating individual airports regardless of whether the owner is the military or MOCT. Even if domestic user charges remain lower than those of international services, such a management model could improve managerial and operational efficiency, and establish transparency.

41. Any increase in air travel costs due to the loss of subsidies (via airport operations) after the corporatization of KAA, should not affect the two domestic airlines. At present, even with low airport user charges, domestic operations are in the red; but if the Government deregulates tariffs for air and its competing modes, domestic airline operations should be fully possible.

42. **Coordinating Transport Modes.** Central and local governments recognize the need for greater coordination among modes, but the traditional hierarchies and decision-making procedures have been organized along modal lines. This takes time to change and requires fewer, rather than more controls. There is still a role for planning and coordination, but the modes and agencies need to rely more on the market to find an optimal combination of modal services.

43. Multi-modal coordination should be improved in both urban and inter-urban transport. In urban areas, auto, taxi, rail and bus are substitutes as well as complements. Prices should reflect their relative costs, including the social costs of congestion and pollution. Otherwise, users select modes in ways that are inconsistent with the costs incurred. For instance, fares and services between bus and subway are not integrated and as riders must pay double fares for combined bus-metro or bus-bus trips they prefer to use cars over public transport. Appropriate pricing of transit and subways is as important for improving modal coordination as pricing automobile use correctly.

44. Better coordination among modes in inter-urban transport is also urgently needed. Since prices on all modes are low, each mode/company is reluctant to raise prices, because it would be thwarted by the presence of under-priced competitive modes. In this respect, a correctly priced high speed rail (HSR) on the Seoul-Pusan corridor will be crucial for coordinating the various modes and determining the financing requirements for its construction.

Strategies for Mobilizing Financial Resources

45. If the proposed projects indicate high economic rates-of-return, then various mechanisms for mobilizing additional finances to bridge the potential "gap" in resources should be examined.

46. There are four basic strategies to mobilize financial resources specifically in the transport sector (see Chapter VI), and a fifth that has importance beyond the transport sector. These are:

(a) Pricing reform;

(b) Private sector participation in infrastructure;

(c) Use of existing assets to mobilize financial resources;

(d) Broadening the range of Government support;

(e) Development and liberalization of capital markets.

47. **Pricing Reform.** As noted earlier, prices should be linked more closely to costs and market conditions, and pollution and congestion where applicable. This will enable transport operators to set prices high enough to cover costs, and thereby ensure they will expand profitable services.

48. **Private Sector Participation in Infrastructure.** The Government is emphasizing increased private sector participation in transport infrastructure. Although its main purpose is to raise additional resources to finance major infrastructure projects, the participation may also improve the managerial and operational efficiency of the infrastructure. Korea already has some experience with private sector involvement, notably with the construction of the new port facilities.

49. However, the current privatization initiative should consider the following:

(a) Pricing has to be market-driven and subsidies made more explicit to attract greater private sector participation on a "project-finance" basis;

(b) Continued regulatory intervention will result in excessive political risk and possibly even more complex cross-subsidy arrangements, including potential use of the proposed loan guarantee fund as a mechanism for delivering subsidies to private enterprises;

(c) Excessive reliance on real estate for cross subsidy should be avoided;

(d) A transparent project selection process that is consistent with public investment priorities should be developed;

(e) Various forms of privatization should be examined including "build-operate-transfer" (BOT), leasing and management contracts.

50. A large project may be broken into major elements or bid as a single undertaking, depending on the scale and complexity involved. In fact, considerable value can be derived from tendering public real estate assets through leasing, without necessarily privatizing the entire transport venture. Similarly, the ability to let franchises and concessions is an option for unlocking the value held in existing assets, as well as capitalizing future revenue streams from new facilities. This is similar to the privatization strategy being pursued by KMPA and KCTA and could yield increased managerial efficiency and cost savings, along with higher revenues. Out-sourcing and management contracts are another approach. Transferring public enterprises to private firms under management contracts which include incentives for performance, cost savings and new revenues would permit a strong, but transparent public sector role in activities where pricing subsidies are inevitable or the result of explicit policy decisions. Even where the public sector maintains its operations, specific functional areas (such as computer services, property management, equipment overhauls, or maintenance and construction) could be bid competitively. These alternatives would permit in-house forces to bid for work and create competitive pressures to improve quality and reduce costs.

51. **Use of Existing Assets to Mobilize Financial Resources.** The most immediate and potentially attractive way for the Government to generate new sources of capital may be through franchising, divesting, securitizing and re-financing existing assets. To realize their value, price reforms and possibly some debt restructuring will be needed. Because of lower risk levels attributed to the utilization history and reduced exposure for construction cost overruns, capitalizing revenue streams of existing assets will yield higher private capital compared with privatizing new facilities. Examples may include disposing of underutilized land held by public agencies and corporations, franchising existing toll roads, leasing multi-purpose shipping berths (the KMPA program), leasing KNR's existing and future rolling stock, franchising the operations and maintenance of existing subway lines, or converting Kimpo Airport to alternative uses when the new airport is completed.

52. **Broadening Government Support.** Nearly all Government support for transport investment has been in the form of direct grants, loans to municipalities and public corporations, or indirect cross-subsidies. In some cases, loans were on soft terms, with maturity of 20 years, amortization of over 15 years, and below-market interest rates. However, various other approaches exist that would constitute conditional sovereign obligations (rather than full faith and credit commitments) and would be less distorting to prices and project finances. These mechanisms include public service obligation payments, service contracts, earmarked tax revenue bonds and leases.

Table S-5: Projected Central Government Vehicle-Related Revenues and Planned Infrastructure Expenditures 1993-1997

Source of Government Revenues & Planned Expenditures	1993	1994	1995	1996	1997	Totals for 1993-97
Gasoline Taxes	1,534	1,943	2,368	2,823	3,276	11,944
Diesel Taxes	306	525	599	680	768	2,878
Excise Taxes (pvt. car)	628	693	762	827	894	3,804
TOTAL	2,568	3,161	3,729	4,330	4,938	18,726
Projected Government Infrastructure Expenditures	3,718	5,570	7,152	8,399	8,810	33,649

Source: KOTI, *Mid-Term Financing Report*, text table, page 109, 1993.

53. Converting cross-subsidies to more explicit forms of Government contract payments would facilitate the transition to market pricing and provide a basis for financing future capital investment. For example, establishing a long-term contract between the Government and KNR to provide a certain volume of capacity for low-income passengers or bulk commodity shippers would remove the distorting effects of cross-subsidies from the railroad's financial projections. This would also enhance the railroad's market value under a corporatization program, and thereby increase the proceeds of stock issued by the Government. In addition, KNR could establish contract payments as the revenue source for bond or preferred stock issues to raise additional long-term capital. These payments would be subject to annual appropriations and would not be considered grants or credit sovereign obligations.

54. Similarly, re-financing KHC and subway-related debt with long-term bonds backed by a reliable revenue stream can be accomplished without encumbering the Government's general obligation debt. One approach is to impose a surcharge on existing gasoline and diesel taxes that would be earmarked for debt service for 15 to 30 years through a new category of "revenue bonds." The bonds would be backed solely by the surcharge revenues, not Government grants or credit.

55. Revenue bonds could be exchanged for maturing subway bonds, short-term KHC borrowing, or other transport obligations. This strategy might help clear the balance sheets of KHC, PUTA and the Seoul subway of short-term debt and debt for which internally-generated revenues are

insufficient. Relieved of their debt burden, these entities could apply a larger part of their capital funds to construction and become more attractive candidates for some form of privatization. The Government would re-finance the obligations of its public corporations without expanding its own deficits. Here again, service contracts and revenue bonds could help deepen Korea's capital markets by offering a range of new securities which are longer-term and whose risks can be readily evaluated by the emerging pool of investors.

56. **Development and Liberalization of Korean Capital Markets.** All the above steps will require continuing liberalization of the financial sector. Deregulating interest rates and establishing a yield curve would permit transport investments to gain access to longer-term debt that is better matched to the stream of anticipated benefits they will yield. Rate fluctuations also would permit risks to be closely analyzed and would produce a broader range of capitalization opportunities for "project financing" than guaranteed debt. In addition, the variation in credit risk would permit the types of off-balance sheet public financing described earlier to be domestically financed by the Government and municipalities. Public corporations with accumulated short-term debt (e.g., KHC, Seoul and Pusan subway corporations) would benefit the most from the development of capital markets.

Summary of Recommendations

57. A summary of recommended actions is presented in Table S-6. However, in broad terms, Government action is needed most in two areas: (a) mobilization of additional resources by increasing transport user charges/fees and taxes, while at the same time easing the regulation and control of tariff setting and entry of commercial operators; and (b) actions for relieving the existing debt burden of major public corporations, and for creating a framework for long-term financing in conjunction with the on-going financial liberalization. These areas are critical for the sector and equally important for enhancing the planned participation of private sector in transport.

Table S-6: Summary of Recommended Measures for Resource Mobilization in Korean Transport Sector

Area of Intervention	Objectives	Recommended Measures	Executing Agencies
Public Expenditure Program	Redefine sectoral investment strategy and planned investments within and between transport modes.	Increase transport investment more gradually than called for in the new five-year plan.	MFE; MOCT;
		Mobilize additional resources by increasing prices of transport services through user charges and/or transport taxes.	MFE; MOCT; corps.; cities
		Include debt restructuring and debt service obligation of public corporations in projected capital requirements.	MFE; MOCT;

Area of Intervention	Objectives	Recommended Measures	Executing Agencies
Public Expenditure Program (Cont.)	Debt restructuring for public corporations	Initiate actions based on a study that identifies strategies necessary for relieving the existing debt burden of public corporations, such as KHC and PUTA, examining the options for increasing government equity, exchanging outstanding short-term bonds for long-term securities, issuing revenue bonds pledged against certain reliable sources of revenue such as gas/diesel tax surcharges and others.	MOCT; MFE; public corps.
Government Control of Prices	Cease to control transport prices as an anti-inflationary measure	Ease Government controls of all transport user charges while strengthening the role of resource allocation decisions.	MFE; MOCT
Transport Pricing	Encourage cost-demand based pricing policies.	Allow further differentiation of port, airport and rail user charges to adequately reflect the costs of different services and the level of congestion at each facility. Pricing should encourage efficient use of facility. Subsidies should be direct, transparent and well targeted. For a realistic assessment of cost recovery, the accounting system for public corporations should reflect all capital costs including Government grants and investments.	MFE; MOCT; mode specific public corps./ agencies
		Restructure charges to adequately reflect the road usage and damage caused by each class of vehicles. Based on a study, implement an axle-load and distance-based user charging mechanism (similar to New Zealand).	MFE; MOCT; KHC
		Differentiate toll rates to closely reflect the congestion costs in addition to highway use and damage. The policy should account for urban and inter-urban facilities, traffic peaking characteristics and highway wear.	MFE; MOCT;
		Promote congestion charging mechanisms (e.g., cordon pricing, time-based charging and point pricing) for congested urban facilities or areas following a comprehensive study.	MOCT; cities
		Maintain fare revenues of urban subway systems to cover at least direct costs of operation, maintenance, administration and replacement of assets.	MFE; MOCT; subway operating agencies; cities

Area of Intervention	Objectives	Recommended Measures	Executing Agencies
Transport Pricing (Cont.)	Encourage cost-demand based pricing policies (Cont.)	Phase out all forms of existing subsidy to public and/or privately provided parking. Parking supply and pricing should be used as a proxy for congestion management where feasible. Subsidy to public parking should only be considered for strategic initiatives as part of mode-shifting policies, such as for park-ride arrangements in locations where public transport capacity should be utilized and parking is less likely to generate extra road traffic (e.g., subway stations in outer areas).	MOCT; cities
		Adjust the level of excise tax on diesel fuel relative to the tax on gasoline for improving cost recovery from road users. Fuel pricing should encourage use of clean fuel.	MFE; MOCT;
Economic Regulations	Regulatory reform for the motor carrier, bus and taxi industry	Relax the system of quantity licensing, such as restriction on entry through the criteria of route assignment, fleet size and type/size of vehicles; instead emphasize the quality aspects, such as tests of personal, commercial, financial and legal fitness and vehicle emission standards.	MOCT; bus and truck operators
		Phase out the rules prohibiting the transport of freight at rates below those established by MOCT.	MOCT; truck operators
		Encourage private bus operators to match the qualitative requirements of the users by allowing the provision of several grades of services with different fares/waiting times/vehicle quality.	MOCT; cities; bus operators
	Regulatory reform for the airline industry	Ease controls over fare setting and services of domestic airline industry in tune with the pricing reform undertaken for the competing road-based modes.	MFE, MOCT, KAA, KAL, Asiana
Transport Industry	Decentralization and corporatization	Delegate fare-setting powers for urban subways to the local governments.	MFE;MOCT
		Initiate the planned corporatization of KNR. Introduce a transparent mechanism for subsidizing uneconomic services (e.g., 3rd & 4th class), such as PSO. Foster commercial orientation.	MFE; MOCT; KNR
		Unbundle revenue-generating functions of ports, airports and subways and consider them for divestiture, commercialization and contracting.	MFE; MOCT;

Area of Intervention	Objectives	Recommended Measures	Executing Agencies
Users of Transport Facilities and Services	Modal coordination	Promote bus-subway fare integration. Undertake studies and initiate pilot projects to demonstrate bus-subway revenue sharing mechanisms.	MOCT; cities; subway agencies; bus operators.
		Strengthen the institutional capacity of local governments to develop and monitor a composite strategy for pricing bus, subway, taxi and parking facilities. MOCT should develop training programs, guidelines and a few pilot projects for city governments.	MOCT; cities
		Promote multi-mode coordination in interurban markets such as the Seoul-Pusan corridor, because decisions on mode-specific pricing, service expansion and regulation would directly impact the use of modal alternatives and resource allocation.	MFE; MOCT;
Resource Mobilization	Enhanced private sector participation	Encourage private sector participation for efficiency gains from better management practices, and for risk reduction in terms of costs, by using turn-key contracts and leasing.	MFE; MOCT; Corps.
	Utilization of existing assets	Mobilize financial resources through franchising, divestiture, and securitization of existing assets, such as land, public parking, toll roads, port births, rolling stock, airports, operation and maintenance of subway lines, etc.	MOCT; MFE; concerned agencies
	Broadening the financial support of the government	Diversify the existing mode of Government financing that constitutes conditional sovereign obligations instead of credit commitments, e.g., issuance of revenue bonds, subsidy through public service obligation payments, leases and service contracts.	MFE; MOCT;
	Liberalization of financial markets	Accelerate the ongoing liberalization of financial markets in order to create long-term debt instruments suitable for transport investments and to attract foreign and private capital in the sector.	MFE; MOCT;

I. INTRODUCTION

1.1 The transformation of the Korean economy is recognized throughout the world. Over the past two decades, per capita income levels grew substantially and now exceed US$6,500. The country achieved extremely rapid economic growth, averaging almost 9% a year since 1980, and freight and passenger traffic increased even more rapidly. To respond, Korea developed a multi-modal transport network within the confines imposed by the country's mountainous terrain.

1.2 In the past, Korean transport policy was designed to expand capacity while retaining regulatory controls to limit price increases and provide some direction for the industry. Although substantial public investments created additional capacity to ease bottlenecks in rail, roads, ports, aviation and urban transport, demand continues to seriously outstrip capacity (under the present regulatory and pricing environment and the current pace of economic growth); and all modes are showing location and time-specific signs of congestion. For example, peak period traffic congestion in large urban areas, particularly in Seoul and Pusan, has severely affected the economic life of these cities. Similarly, most modes are operating at or above capacity along the Seoul-Pusan corridor, a dominant axis that links most large cities.

1.3 Until recently, the major challenge in transport was building infrastructure to facilitate development while controlling it either through direct ownership and operation by Government agencies or by regulatory controls on private operators. Overlaying this was a macroeconomic policy to limit inflationary pressures. While one could debate elements of the strategy, it appears to have worked, at least until recently. However, the experience of the last few years reveals a need to re-think them. Pressure still exists to expand infrastructure, but increasingly Korea will need to improve both its use and the performance of transport companies.

1.4 Under the Seventh Plan (1993-96), Korea intends to invest almost US$45 billion in inter-urban transport (in several mega-projects such as the Pusan-Seoul High Speed Rail System), and about US$25 billion in six urban rail transit systems (to be completed by 2001). Mobilizing the necessary resources will be a major challenge, since present pricing structures and Government financing will not be sufficient. Creative solutions to fund new investments and greater scrutiny of funding trade-offs have become critical.

1.5 The transport problem is not one of underutilization or one of poor performance in terms of service quality. Rather, Korea's challenge is to increase reliance on market mechanisms to address the need for additional resource mobilization and improved management of demands across modes. A combined strategy of increased capacity and demand management seems appropriate given that there is a limit to which a supply-oriented strategy can be pursued to meet the rapid growth in demand at a sustainable level. Transport pricing has yet to be fully appreciated as a means for demand control, improved cost recovery, and the efficient utilization of transport facilities. However, if current prices reflect the true cost of services, charges will (a) generate additional revenues, (b) move riders/freight to the most efficient modes and (c) help decision-makers determine where resources should be invested. Reducing price distortions will also encourage the

private sector to invest in the modes that sustain development at the lowest social cost (which includes externalities, such as vehicular pollution).

1.6 The growth of Korean markets has brought a proliferation of products, services, freight movements and travel, which means that centralized controls needed to be scaled back and concentrated on fewer strategic choices. As a result, authorities moved to decentralize many Government decisions as well as allow transport users to play a greater role in influencing what facilities and services are provided and who is to pay for them. Korea is already taking steps in these directions by corporatizing former Government departments and agencies, and expanding private participation. The report builds on this momentum, offers suggestions about policy directions and discusses how added transportation challenges can be met.

1.7 In sum, Korea must find ways to finance needed infrastructure investments and to identify measures that can improve performance and use of existing transport capacity. These provide the issues around which this study is conducted.

1.8 The study's objectives are:

(a) To review the state of transport in Korea and its future direction in terms of performance, priorities and balancing of modal investments and institutional policies;

(b) To assess the near-term financial resource requirements and constraints;

(c) To examine options for pricing and regulatory reform in the various transport markets to improve performance;

(d) To identify innovative public and private financing options.

1.9 Chapter II reviews trends in inter-city passenger and freight markets as well as urban transport. It also reviews recent levels of transport infrastructure investment and the adequacy of current capacity. It examines whether Korean infrastructure investments have fallen behind the levels which are desirable to promote economic growth and whether past trends can continue and generate the finance needed for planned investments.

1.10 Chapter III reviews projected transport infrastructure plans and their financial implications. Also, it examines the likely macroeconomic constraints on the level of transport investment anticipated for 1992-97. The order of magnitude of the potential financial shortfalls is assessed and ways to close the financing gap are identified.

1.11 Chapters IV and V review the pricing practices in urban and inter-urban transport sectors. The need for reforming current pricing and regulatory policies is examined in order to generate additional resources and at the same time improve the utilization of various modes by bringing prices closer to true costs of services. The likely impact of underpricing on demand for alternate modes, congestion and financial needs is also reviewed and options for new pricing within each sub-sector are presented.

1.12 Chapter VI focuses on potential strategies for closing the financing gap for transport investments. It reviews the revenue-generating capability of different levels of government and public corporations and emphasis is placed on identifying innovative partnerships between government and the private sector to provide infrastructure and generate funding from new sources.

1.13 Numerous opportunities exist for change which can improve transport performance within and between modes, as well as mobilize the finances to meet the growing transport demands. Koreans have overcome economic challenges before, and there is every reason to expect they will succeed again. It is hoped this review will help guide this next economic transformation.

II. TRANSPORT AND INVESTMENT TRENDS IN THE KOREAN ECONOMY

A. Transport Trends and Modal Shares

2.1 Within the limitations imposed by the country's mountainous terrain, Korea developed a multi-modal transport network capable of supporting its sustained and phenomenal economic growth. In the three decades since 1962, real GNP grew almost three-fold, and per capita income is now more than 15 times higher. However, the pace of growth placed high demands on all infrastructure, including transport, as discussed here.

Freight Transport

2.2 Freight traffic has grown substantially. Total tonnage increased about 13-fold from 1971-92; ton-kms increased by over five-fold. Of the total, road transport accounts for the largest share in terms of tonnage and ton-kms, if non-commercial or private trucking is included. The share of tonnage carried by private fleets has grown substantially while the share by commercial trucks has fallen. Together, the two account for more than 90% of total tonnage, and 44% of total ton-kms. The rail share of tonnage fell dramatically although total tonnage almost doubled. Coastal shipping's share slipped, despite a several fold increase in total tonnage. Domestic air cargo grew six-fold from 15 million ton-kms to 94 million ton-kms between 1983-92, while international air cargo ton kms increased three-fold over the same period, from 1,607 million ton-kms to 4,670 million ton-kms (MOT, 1993).[1] Air freight grew many times, but still is a minuscule share of total tonnage (see Table 2-1).

2.3 International sea-borne trade (tons) handled through Korean ports has grown steadily; it more than doubled from 133 million tons in 1985 to 286 million tons in 1992. Domestic sea freight is also a significant factor in the Korean economy. Coastal volume increased two and a half times from 34.2 million tons in 1985 to 85.9 million tons in 1992, while the total domestic freight for all transport modes increased by much less. Equally significant, in terms of ton-km, domestic sea freight increased more than three-fold from 1985-92, while overall domestic freight ton-km only doubled.

Inter-Urban Passenger Transport

2.4 The total number of passenger trips rose over seven times from 1971-92 and about five and one-half times for passenger kms. Most striking is the increase in the highway and aviation sectors. The largest mode share is for commercial buses, although their share fell from almost 90% in 1971 to about half the market by 1992. The share of travel by non-commercial highway vehicles (private cars) now amounts to 40% of all trips and a 25% share in terms of passenger kms. Inter-city rail experienced substantial growth in passengers carried, although its market share slipped by over one-fourth. Aviation grew substantially although it still has less than 3% of total passenger kms (see Table 2-2).

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[1] *Statistics Yearbook of Transportation*, MOT, 1993, pp. 231-245.

Table 2-1: Korean Domestic Freight Traffic 1971-1992
(million tons)

Unit: Million

Year	Mode											
	Inter city Rail		Highway				Coastal Maritime		Aviation		Totals	
			Commercial		Noncommercial							
	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km
1971	32	7841	73.9	3302	10.3	237.5	11.3	4653	0	0	127.5	16033.5
1981	48.8	10815	104.3	4868	226.5	5217	22.2	7927	0.0176	6.5	401.8	28833.5
1991	61.2	14494	245.1	10530	1080	24251	76.1	24737	0.2	79	1462.6	74091.0
1992	58.8	14256	266.0	11364	1271	28546	85.9	35981	0.242	94	1681.9	90241.0

Modal Share (percent)

Year	Rail		Highway				Coastal Maritime		Aviation	
			Commercial		Noncommercial					
	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km	Ton	Ton km
1971	25.10	48.90	57.96	20.59	8.08	1.48	8.86	29.02	0.00	0.00
1981	12.14	37.51	25.96	16.88	56.37	18.09	5.52	27.49	0.00	0.02
1991	4.18	19.56	16.76	14.21	73.84	32.73	5.20	33.39	0.01	0.11
1992	3.50	15.80	15.82	12.59	75.57	31.63	5.11	39.87	0.01	0.10

Source: MOT, *Statistical Yearbook of Transportation*, 1987-92 issues.

Table 2-2: Korean Domestic Passenger Traffic 1971-1992

(Passengers and Passenger kms, millions)

Unit: Million

Year	Mode													
	Inter-city Rail		Subway		Highway				Maritime		Aviation		Totals	
					Commercial		Noncommercial							
	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km
1971	128.2	8750	0	0	3024	22917	248.7	1217	6.4	256	1.1	314	3408.4	33454.0
1981	444.1	21528	88.3	1258	8683	67315	1080	5076	9.3	480	1.6	557	10306.3	96214.0
1991	679.3	33470	1249.1	11891	12854.2	87697	8325.9	38642	8.5	524.2	12.2	4447	23129.2	176671.2
1992	716.4	34787	1359.6	12970	12848.7	83152	9993.4	46591	8.7	524.5	14.6	5233	24941.4	183257.5

Modal Share (percent)

Year	Inter city Rail		Subway		Highway				Maritime		Aviation	
					Commercial		Noncommercial					
	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km	Pas	Pas km
1971	3.76	26.16	0.00	0.00	88.72	68.50	7.30	3.64	0.19	0.77	0.03	0.94
1981	4.31	22.38	0.86	1.31	84.25	69.96	10.48	5.28	0.09	0.50	0.02	0.58
1991	2.94	18.94	5.40	6.73	55.58	49.64	36.00	21.87	0.04	0.30	0.05	2.52
1992	2.87	18.98	5.45	7.08	51.52	45.37	40.07	25.42	0.03	0.29	0.06	2.86

Source: MOT, *Statistical Yearbook of Transportation*, 1987-92 issues.

2.5 Coastal transport plays a modest role in passenger transport. In 1985, there were almost three times more coastal passengers compared to airline passengers; however, while the number of coastal passengers has stagnated at around 8.5 million per year, the number of domestic air travellers increased from 3.5 million in 1985, to 14.5 million in 1992 (MOCT). Both, however, are insignificant when compared to the half-billion inter-city railway travellers in 1992.

2.6 Compared to the 11.3 million air travellers on international flights in 1992, international sea travel constitutes no more than 2.9% of Korea's international passenger traffic.

Urban Transport Trends

2.7 In 1990, Korea's population was estimated at 43.5 million, of which 34.6 million were urban, living in 246 municipalities. While the country's population growth rate declined to less than 1% in the last decade, the urban population grew by 3.2% per year from 1980-87. Seoul (10.6 million) and Pusan (3.9 million), the two largest cities among the six cities with over one million population and where about one-third of Koreans live, grew annually by 1.9% and 1.54%, respectively, from 1984-90.

2.8 In most large Korean cities, public transport modes account for 70%-80% of peak hour passenger movements (see Table 2-3 for modal shares of urban passenger movements in Seoul and Pusan, the two largest Korean cities). A high proportion of trips are made by taxi (see Table 2-16).

2.9 With the continuing rise in income and living standards, residential growth in suburbs, and the development of a local car manufacturing industry, nationwide vehicle ownership (excluding motorcycles) increased from about 0.38 million in 1983 to 3.5 million in 1993, almost a 9-fold increase within a decade (see Table 2-4). The total number of registered vehicles was 4.25 million in 1991 and 5.25 million in 1992, almost a 20% increase in one year. It is forecast that the total number of registered vehicles will more than triple, from 4.25 million to 13.8 million between 1991-2001 (Cha, 1993).

Table 2-3: Modal Shares for Major Cities (% of total)

	Bus	Urban Rail	Taxi	Private Car	Other
Seoul	55.4	16.7	13.4	13.8	1.5
Pusan	45.2	7.2	22.3	13.9	10.9
Tokyo	5.7	71.4	4.9	17.5	-
London	8.2	75.5	-	14.4	1.9
Paris region	10.6	19.9	-	65.5	4.0
New York*	8.0	18.8	0.8	63.0	9.4

* For work travel purposes only.

Table 2-4: Stock of Automobiles 1983-1992

	1983 (thousand)	**1993** (thousand)	**Ratio** 1993/1983
Seoul	205	1,194	5.82
Pusan	37	259	7.00
Taegu	24	212	8.83
Inchon	11	162	14.73
National total	381	3,461	9.08

2.10 In 1991, Seoul and Pusan had 112 and 76 registered vehicles per thousand population respectively. For Korea as a whole there were 16 persons per car and 10 persons per road vehicle. These figures show more people per vehicle than some other countries at similar levels of development. (Singapore had 9.7 people per car and 6.6 people per road vehicle and Malaysia had figures of 9.0 and 7.5 respectively). But the rate of growth in Korea is unparalleled and projected to reach one car for every 3.3 people early in the next century, which is similar to the 1991 level for Japan (3.3) and Spain (3.1).

2.11 Although it is predicted that use per vehicle will decline, which could partially offset the growth of the vehicle stock, passenger demand is expected to almost double in the current decade.

B. Transport Capacity

2.12 Over the 30-year period covered by the six national economic development plans, the economy grew and developed at rates among the highest in the world. Transport infrastructure expanded along with the demand for services, covering both domestic and international needs in all modes. Nonetheless, the rapid growth of demand is straining the capacity of existing infrastructure in freight, inter-city passenger and urban transport (see para. 2.20 for a discussion of land transport congestion in relation to passenger service).

Freight Transport

2.13 The story is similar for aviation and ports. KOTI has forecast total air cargo demand measured in ton kms to increase 13.3% annually, or three and one-half-fold from 1991-2001. And, if price levels are appropriate, there should be no constraint on the supply of aircraft to handle this growth, while retaining an adequate level of service.

2.14 However, the cargo terminal capacities of the major airports may become constrained: MOCT and KAA report that in 1993, two of the three largest Korean airports (Kimpo and Kimhae), which handle two-thirds or more of all domestic and international Korean air traffic, were approaching or already exceeding full utilization of their air cargo capacity.

2.15 Investments are underway to expand Kimpo's freight terminal capacity to more than double the present level, but the congested terminal at Cheju has not been allocated any MOCT funds. No indicators are available to show the present and future economic losses due to such congestion.

2.16 International and domestic sea freight handled through Korean ports have grown steadily. Port infrastructure and the vessel fleet have been rapidly expanded to meet growing demands, but overall congestion still persists--though at a lower level, in terms of system-wide averages (see Table 2-5).

Table 2-5: Some Congestion Indicators in Major Korean Ports[1] 1991-93

Congestion Indicator	1991	1992	1993
1. Total arriving vessels	32,487	33,924	36,593
1. Vessels waiting at port	6,289	4,087	4,267
2. Total waiting hours	427,253	183,947	164,853
3. Vessels waiting > 12 hours	5,364	3,212	3,145
4. Hours waited by these	417,740	178,328	157,900
5. Average hrs waiting by those waiting > 12 hours	77.9	55.5	50.2
6. Average waiting, all vessels	13.2	5.4	4.5

Source: KMI.

1. The ports include: Pusan, Inchon, Masan, Ulsan, Tonghae, Kunsan, Makpo, Kwangyang (including Yochon), and Pohang.

2.17 The congestion and waiting times shown in Table 2-5 are heavily influenced by Inchon where around 40% of the waiting occurs, and by Pusan and Kunsan. More than half the vessels arriving at Inchon and Kunsan in 1991 had to wait; and, even in 1993, after the building boom pressure had eased, more than every third vessel at Inchon had to wait for an average of 40.6 hours. These three ports accounted for 80% of the total waiting hours in 1991, and 66% in 1993. These waiting times were reduced by more than 50% in 1993, but delays are still common.

2.18 Container traffic is of special interest because these vessels have a very high daily opportunity cost. Pusan handles 95% of all container traffic, with around 4,000 vessels annually, but the numbers declined slightly since 1990. At the peak in 1991, 1,096 container vessels, or more than every fourth ship had to wait an average of 28.5 hours, and 942 waited for more than 12 hours. The number of waiting ships, as well as the waiting time, declined sharply in 1992.

2.19 The annual direct and indirect economic losses due to such delays and ship waiting were estimated to several tens of billions of won for this period. KMI estimated that in 1989 and 1990--prior to the 1991 waiting time peak--the direct economic losses caused by the delayed ship time were W50 and W70 billion, respectively. The indirect losses due to the increased costs of Korean exports resulting from higher transport expenses, would be even higher.

Table 2-6: Trends in Automobiles, Road Budget, Capacity and Congestion 1983-1992

Item	1983	1988	1992	Annual Average Increase 1983-1992
Vehicles (000's)	784	2,035	5,231	23.5%
Central Govt. Budget (100M Won)	4,978	5,394	26,195	20.3%
Road Capacity (Expressway, National & Provincial Roads in km)	23,515	24,383	24,449	0.43%

Congested Major Roads*

Item		1988	1989	1990	1991	1992	Annual Avg. Increase 1988-1992
Congested Road Length in km	Expressway	151	279	417	576	652	44.2%
	Nat'l Trunk Roads	663	945	1,559	2,287	3,238	48.7%
	Provincial Roads	106	194	263	380	508	48.0%
Total		920	1,418	2,239	3,243	4,398	47.9%

Source: *Transportation Section Financial Plan Report*, 1993, KOTI, Korea, pp 28, 31, 33, 41.

* Based on volume/capacity ratios relative to design standards.

1. Road investment budget means the invested budget amount used for expressways, national trunk roads and provincial roads. Metropolitan and country roads are excluded.
2. Congested roads means the congested road sections in expressways, national trunk roads and provincial roads.

Passenger Transport Capacity

2.20 Investments in transport equipment and infrastructure have grown along with the growth in demand, but transport demand has outstripped the available capacity, causing congestion in road and rail infrastructure. The central Government road building budget increased at an annual average rate of 26.7% from 1980-90, but due to the increased cost of road construction and land acquisition and predominance of road widening work, the length of expressways and national trunk roads only increased by 7% during the same decade (Table 2-6). Thus, despite the relatively large investments, capacity of the tolled expressway, national and provincial road networks has not increased enough to meet the capacity needs of rapid motorization over the last five years. The congested sections of trunk roads increased from 814 kms in 1988 to 3,890 kms in 1992--an increase

of almost 48% per year. Also, data on expressways indicates that travel times nearly doubled on the Seoul-Pusan, Seoul-Inchon expressways and the national road 46 from Seoul to Inchon during peak periods. According to an estimate, about 1% of GNP is lost through congestion along inter-urban roads (see Table 2-17). Since the Seoul-Pusan expressway serves almost half the total expressway system traffic, congestion is mainly concentrated along this corridor, particularly near the large cities.

Table 2-7: Railway-Investment Budget and Demand for First Class Train 1983-1992

Item	1983	1988	1992	Annual Ave. Increase 1983-92
Railway Lengths (km)	6,128	6,456	6,496	0.7%
Railway Investment Budget (100 Million Won)	1,283	2,175	10,637	26.5%
Demand for 1st Class Train (Thousand Passengers)	1,883	5,317	10,253	20.7%

Source: *Transportation Section Financial Plan Report*, 1993, KOTI, Korea, pp 37, 41.
Statistical Yearbook of Transportation, 1993, MOT, pp 56, 57.

2.21 Similarly, rail investment grew by an annual average of 26% over the decade, but total rail mileage changed little (Table 2-8), as a large share of the investment was directed to equipment and related facilities. At the same time, passenger and freight ton kms increased at an annual average rate of 4.5% and 2.3%, respectively, which, when combined with the relatively stable route kilometers, caused traffic density to rise significantly: From 1976-92, it grew at an annual rate of about 4% (Table 2-8).

2.22 The road and rail data reflect increasing congestion on both modes. According to KNR, most of the rail trunk lines have reached saturation. On the Seoul-Pusan Line, 136 trains operate daily in each direction, and the line's maximum capacity is 138 trains per day (Yang, 1994).

2.23 With regard to air travel, the steady growth in scheduled flights within and to/from Korea during the last decade has apparently been matched by an increased supply of passenger seat-kms. Domestic passenger-kms and passenger seat-kms increased seven-fold between 1983-92, while international air travel grew nearly three and a half times (Table 2-9). As was the case for air cargo, the growth in domestic demand was substantially higher than that of international air traffic to/from Korea.

2.24 Capacity utilization, measured in terms of the passenger-seat ratio (load factor), was as high as 75.2% in 1983. It declined to 67% in 1992 for domestic air travel with improved supply, and remained stable at around 55% for international travel. The domestic cabin utilization ratio (a measure of capacity use) of 67% or higher is impressive by any standard. By way of comparison,

Table 2-8: Korean Rail Demand 1976-1992

Unit: Traffic: Million

Year	Route km	Passenger	Freight	Traffic Density*
		Passenger-km	Ton-km	
1976	3,144.3	14,305	9,728	7,644
1977	3,141.9	17,099	10,509	8,787
1978	3,152.9	20,055	10,926	9,826
1979	3,158.1	21,386	11,081	10,280
1980	3,134.6	21,640	10,798	10,348
1981	3,121.3	21,528	10,815	10,362
1982	3,121.3	21,034	10,892	10,228
1983	3,120.7	21,688	11,629	10,676
1984	3,116.4	21,884	12,033	10,844
1985	3,120.6	22,595	12,296	11,181
1986	3,113.4	23,563	12,813	11,684
1987	3,129.9	24,457	13,060	11,987
1988	3,148.8	25,978	13,784	12,628
1989	3,120.4	27,390	13,605	13,138
1990	3,091.3	29,864	13,663	14,080
1991	3,091.3	31,454	14,494	14,864
1992	3,092.4	32,218	14,256	15,092
Annual % Growth	-0.10%	5.21%	2.42%	4.32%
% Annual Growth (1988-92)	-0.10%	4.50%	2.29%	3.87%

Source: *Statistical Yearbook of Railroad 1993* (Korean Railroad, Korea).
* Passenger + Ton km/Route-km

U.S. domestic ratios are 60%-65%, and above 70% is considered extremely high. For international operations, the cabin factor on North Atlantic and East- and Southeast Asia flights tends to be high (above 70%), but the figures are much lower elsewhere.

2.25 With regard to scheduled flights, the following ratios provide a better understanding of some of the market changes that occurred during the decade of rapid growth. For example, the

number of aircraft owned increased 1.86 times from 1983-92. At the same time, domestic output increased five to seven times, depending on the output measure, and international traffic increased about three times.

Table 2-9: Indicators of Korean Air Transport Development 1983-92, Scheduled Traffic; 1992/1983 Ratios

Indicator	Domestic	International
1. No. of aircraft holdings	1.86	-
2. No. of flights ('000)	5.05	2.75
3. Kms flown (million)	5.71	3.07
4. Hours flown ('000)	7.00	3.10
5. Available seat-km(million)	7.20	3.32
6. Passengers ('000)	6.31	2.99
7. Pass-km (million)	6.42	3.38

Source: MOT, *Statistics Yearbook of Transportation, 1993.*

2.26 According to MOCT, three airports handle two-thirds or more of all domestic and international Korean air traffic. These airports are:

- Kimpo (Seoul) 22.47 mill. passengers in 1993
- Kimhae (Pusan) 6.58 " "
- Cheju 7.15 " "

A comparison of the capacity measures to actual use of each airport and airspace in 1993 and future years indicated the need to expand capacity in the future (see Table 2-10 and Table 2-11).

Table 2-10: Capacity Utilization of the Three Largest Korean Airports: Percent Utilization in 1993

Input factor	Kimpo	Kimhae[1]	Cheju
Runway	90%	36%	79.5%
Apron	94.6%	67%	100%
Passenger terminal	Int'l. 77.4% Domestic 96.7%	106% 55%	46.6% 73.2%
Freight terminal	Int'l. 89.6% Domestic full	25.5% 41.7%	- full
Airspace	60%[2]	70%	95%

Source: KAA/MOT.

1. Kimhae International Airport in Pusan is shared with the military, and has in reality no spare runway capacity to meet future demand. 36% utilization means that this is all that is available to civil air traffic.
2. Kimpo has severe airspace limitation due to city restrictions and the DMZ. As a result, only 270^0 of the airspace is available.

Table 2-11: Year When Input Factor Will Become Limiting and Cause Air Traffic Congestion

Airport	Runway	Apron	Pass.Terminal		Car. Terminal		Parking
			Dom.	Int.	Dom.	Int.	
Kimpo	'96	'95 (96)	'95	'97	now	'95	now
Kimhae	now	'05	'10	'97	'10	'10	'03
Cheju	'96	now	'99	'00		now	now
Taegu	-	'98		'10		-	'98
Kwangju	-	now		now		-	now
Kangrung	-	'95		'98		-	now
Sokcho	-	'02		'00		-	'94
Mokpo	-	'00		'98		-	'95
Yusoo	'10	'95		'94		-	now
Ulsan	'10	now		now		-	now
Pohang	-	'94		now		-	now
Sachon	-	'10		now		-	now
Yechon	'10	'98		'03		-	'94
Kunsan	-	'97		'00		-	'95

Source: KAA/MOCT.

The Urban Transport Problem

2.27 Providing mobility in congested urban areas is a worldwide problem. However, Korea faces special challenges because of the combination of a rapid increase in living standards and population growth without a long history of developing the infrastructure to handle demand. Also, geographic constraints such as river crossings and mountains present a special set of issues in large cities.

Table 2-12: Forecast Road Vehicle and Traffic Growth 1991 - 2001

	1991	2001	Growth (%)
Vehicle registration (thousand)	4,250	13,800	225
Passenger demand (billion passenger km)	275.2	553.3	101
Freight demand (billion ton km)	2,247.2	5,238.4	133

Source: Internal Forecasts, Ministry of Transportation, quoted in Dong-Deuck Cha "*A Long Term, Stable Financing Strategy for Transport Infrastructure*" paper presented at the China Transport Policy Seminar, Shenzhen. December 1993.

Urban Road Infrastructure

2.28 A notable feature of Korean cities is the small proportion of urban space devoted to roads. In 1988, this was 10.6% for Kwangju, 11.6% for Pusan, 12.0% for Inchon, 14.0% for Taegu and 17.3% for Seoul, as compared with 20%-25% for many historic European cities.

2.29 Given the low starting point, the potential exists to relieve the congestion in some cities by constructing roads: By 1994, roads in Seoul had already been expanded to 18.96% of the city area (71.0 km^2), and the total roads planned for the city would extend 9,354 km in length and 99.4 km^2 in area, or 26.54% of the urban area. However, apart from the issue of funding such a program, the potential social and environmental disruption caused by increasing the amount of road space to this extent makes such plans questionable.

2.30 It should also be recognized that it might not be possible to build sufficient motorway capacity to handle projected demands (Table 2-12). Although many North American cites have invested heavily in motorways, traffic is still congested (e.g., over 30% of area for roads in Los Angeles).

Urban Public Transport Infrastructure

2.31 The major Korean cities also differ from many cities of comparable size with respect to the amount of rail infrastructure available, as shown in Table 2-13. For example, Seoul is much less well endowed than Tokyo, London or New York, cities of comparable size.

Table 2-13: Metropolitan Area Rail Network Densities (1989)

	Seoul	Tokyo	London + SE Region	New York
Population (million)	17.168	27.266	17.317	16.0
Area (km^2)	11,688	6,607	27,222	7,686
Subway (km)	123	245	404	802
Suburban railway (km)	113	1,829	3,242	3,406
Rail length / km^2	0.02	0.31	0.13	0.55

Sources: RATP, 1992.
US DOT, Transit Profiles, 1992.
DOT Transport Statistics for London, 1980-90.
TRTA Developments Over the Past 50 Years.

Traffic Congestion

2.32 Traffic volumes have grown very rapidly in the major cities since the mid-1980s (see Table 2-14 for traffic trends across selected locations within Seoul between 1986-92). After a relative lull in traffic growth in the CBD from 1988-92, at the river crossings in 1991, and at the

outer boundary in 1992, traffic appears to have grown sharply again in all areas in 1993. For the CBD, growth was 9.6%, for the Han River crossings 8.4%, and for the outer boundary crossings 19.3%.

Table 2-14: Seoul Cordon Traffic Counts
(thousand vehicles)

	1986	1987	1988	1989	1990	1991	1992
CBD	1,098	1,262	1,365	1,288	1,271	1,287	1,278
Bridges	1,171	1,294	1,443	1,394	1,562	1,542	1,612
Boundary	637	841	1,045	1,170	1,425	1,690	1,740

Source: KOTI.

2.33 Due to these changes, speeds declined substantially between 1989-91 outside the CBD in Seoul, but stabilized since then (Table 2-15). Those for the central area were at a minimum in 1990, and rose somewhat since then (1993 data differ from previous years so it is more appropriate to focus on changes up to 1992).

Table 2-15: Daily Average Vehicle Speed in Seoul
(km/hr)

		1989	1990	1991	1992	1993
Car	City	32.60	24.22	21.57	22.62	23.53
	CBD	18.70	16.40	17.66	19.28	19.97
	Outer	37.17	25.78	21.89	22.87	23.79
Bus	CBD	18.60	18.80	18.15	16.88	17.02

Source: KOTI.

2.34 Peak period speeds in Seoul and Pusan are substantially below the average speeds observed in other large cities (See Table 2-16). The local bus systems continue to be the dominant transit mode in large cities, but their capacity is steadily eroded by the traffic.

2.35 Congestion is not just a nuisance to commuters and travellers. Time lost in traffic bottlenecks and slow journeys represents lost opportunities for production or consumption--real economic costs which translate into lower production and standard of living. Estimates of the congestion costs are about 2.5% of GNP; of that total, 60% is thought to accrue in the major cities. Thus, about 1.5% of GNP is estimated to be lost through urban congestion (see Table 2-17).

Table 2-16: Peak Hour Modal Share and Average Speed in CBD in 1992-93

City	Ave. CBD rush hr speed (km/hr)	Peak modal split (%)				
		Car	Bus	Taxi	Metro	Other
Seoul	13.1	14.2	38.4	12.1	25.0	10.3
Pusan	12.4	12.9	45.5	21.5	9.0	11.1
Taegu	19.9	16.9	52.6	16.6	---	13.9
Inchon	20.5	14.8	50.3	13.1	2.0	19.8
Kwangju	15.9	10.5	55.0	24.1	---	10.4
Daejon	17.0	13.9	45.7	25.7	---	14.7

Source: KOTI.

Table 2-17: Congestion Cost Estimates for Road Traffic in Korea
(trillion won)

	Inter-city	Major cities	Total
Vehicle operating costs	881.4	1,379.4	2,260.8
Time costs	1,081.4	1,526.9	2,608.3
Total	1,962.8	2,906.3	4,869.1

Source: *A Study on Transport Congestion Costs*, KOTI. 1992.

Urban Transport and the Environment

2.36 With the growth of population in urban centers and with it, the amount of travel (especially by the motor car), residents the world over are expressing growing concern over the environmental impacts. Concern for lost time and frustration via congestion has already been mentioned. Deteriorating air quality is of growing importance, not only because it is an irritant to eyes and breathing, but because of other health conditions due to atmospheric pollution and possible effects on climatic change.

2.37 Air pollution in Korean cities is not as serious as in many other countries and most measures show that air quality has not deteriorated and has even improved despite rising car use in Korea due to certain positive steps taken in the past (Figure 2-1). Taxis are required to run on less polluting LPG, and domestic cars use only unleaded gas. For buses, research is underway on particulate filters for those that are diesel-powered as well as on the use of CNG. But even best-practice technology in particulate filters is not enforced on buses because of concerns about their effect on costs. However, air quality and other transport-related environmental issues will remain a matter of great concern in the future. They are a function of population, economic growth and

growing vehicular travel, especially in urban areas. At this time there is no strategic plan for environmental improvement. Government has recently displayed a commitment to expand transit service (particularly subways) and demand management actions as measures for limiting car use in urban areas.

2.38 Although subway construction will enlarge the passenger capacity of urban transport systems with the least disruption to air quality, it will result in very high demands for capital. While Seoul and Pusan metros are among the few in the world that nearly cover their vehicle operating and replacement expenses, they, like others, have required substantial subsidies to cover their capital debt service.

C. Transport Investment and Economic Growth

2.39 This section provides an overview of the pace and pattern of Korean public investment in transport. These investment trends are discussed in aggregate terms and are also disaggregated by transport mode and sources of finance. Also, as many believe the sector did not receive adequate investment in recent years, transport investments during the past decade are compared to trends in the 1970s, and their impact on capacity and service is assessed. The under-investment scenario is then evaluated by assessing the productivity impacts of additional investment, as well as by comparing investment shares in Korea to those in Japan (in the 1960s and 1970s) and in Taiwan, China. The conclusion is that Korea's level of investment did not fall dramatically, although spending shifted from the central Government to those at the local level and public corporations. Further, the percent of GDP being spent is not out of line with the levels spent by other countries at similar levels of development.

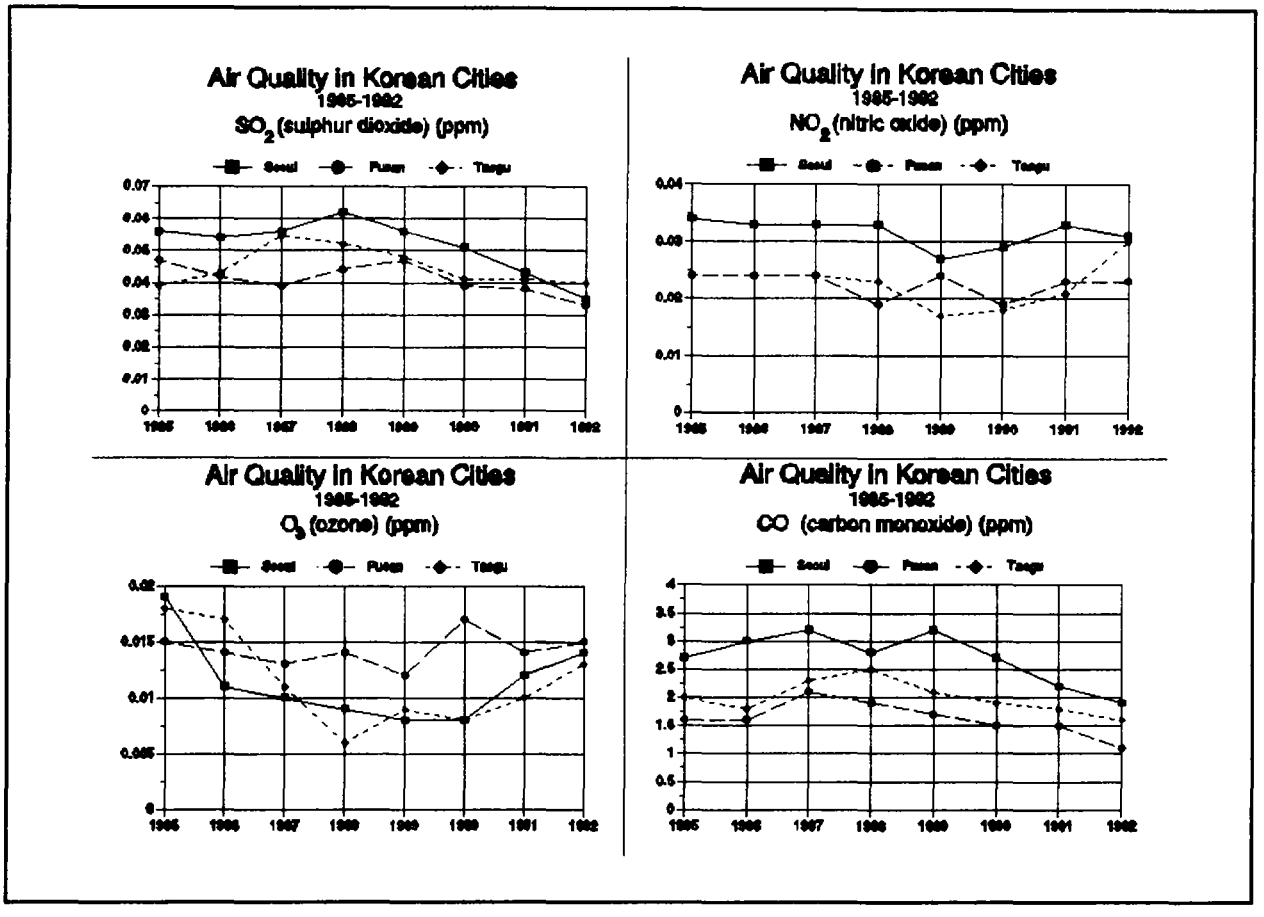
Transport Policies and Investment

Transport Sector Strategy in the 1980s

2.40 The Government's strategy regarding the transport sector did not change substantially during the 1980s. Expanding capacity through investments remained the main thrust, since congestion worsened on road and rail, and service deteriorated on buses and taxis. As in the 1970s, most of the investment was directed to roads. The difference, however, was that these investments (for road and rail) were aimed not merely at building new roads, but at improving the road and rail networks through paving, double-laning, double-tracking, and electrification.

2.41 Extensive controls on the price of transport services, administered by MFE, continue to be in place. These are considered necessary to restrain inflation as well as for distributional reasons, and are highly centralized. Any adjustment has to be approved by MFE, and the tendency has been to prevent price increases. The controls have led to a pervasive underpricing of transport infrastructure and services. Moreover, the uniformity of controlled prices throughout the country results in deep cross-subsidization across regions. The extent of cost recovery has varied across modes but for the sector as a whole, it has been substantially less than full. Hence, the Government is increasingly concerned with identifying new sources and ways of financing transport infrastructure to fill the growing gap between the stated investment needs and the availability of public sector funds obtained through direct and indirect user charges.

Figure 2-1: Selected Measures of Air Quality in Three Korean Cities



Source: KOTI.

2.42 Along with price controls, the elaborate system of regulations on entry and operations for all transport services has remained in place. However, the negative impacts of this pricing and regulatory system on service provision and quality have been reduced somewhat by the exceptions granted to some types of service--most notably luxury taxis and seat buses that are exempt from the more onerous controls. Finally, on the investment side, almost all investment in transport infrastructure during the 1980s was undertaken by the central and local government and by public corporations. Only recently has there been interest in expanding the role of the private sector in this area. Now, private sector participation is viewed mainly as a supplementary source of finance for these investments rather than in terms of its potential to improve efficiency.

Trends in Transport Sector Investment

2.43 **Aggregate Investment Shares.** Both the shares of transport investment (in total investment and GDP) as well as its sectoral composition have changed over the past decade (see Table 2-18). The share going towards the manufacturing sector in 1987-92 was almost two percentage points higher than its average share in the late-1970s. On the other hand, the share for sectors typically considered part of "social infrastructure" was reduced, most notably, electricity, gas and water, and to a lesser extent, transport and communications.

Table 2-18: Korea: Gross Domestic Capital Formation and its Composition
(current prices)

	1971-75	1976-80	1980	1981-85	1987-91	1991	1992
(As percent of GDP)							
Gross Domestic Capital Formation (GDCF)	27.5	32.0	31.7	29.2	35.0*	39.0	36.2
of which: Gross Fixed Investment (GFI)	25.0	31.3	32.1	28.6	34.1*	37.8	35.9
(As percent of GDCF; Composition by Sector)							
Manufacturing	19.3	26.3	23.2	21.3	28.2	24.5	
Electricity, gas and water	5.9	8.0	9.7	9.1	4.3	5.2	
Transport, Storage and Communications	8.1	10.0	12.4	13.5	8.1	6.8	

Source: Bank of Korea, *National Accounts, and Economic Statistics Yearbook*, various issues.
* Average for 1987-92.

2.44 This change in the sectoral pattern of investment over the last decade has been an important factor in shaping the view that Korea has underinvested substantially in social infrastructure. The implicit (and questionable) assumption that underpins this belief, given the trend in investment shares, is that the productivity of investments in the manufacturing sector is lower than for social infrastructure. During the late-1980s, the Korean manufacturing sector went through a period of restructuring in response to rising wages and the appreciation of the won and the increase in the investment share reflected that process. And, as the increasing technological sophistication of Korea's exports signifies, this shift has been valuable in terms of sustaining economic growth. For instance, the commodity composition of exports has shifted sharply with light manufacturing now accounting for about 30% of the total (from 40% in 1989) while heavy manufacturing exports, such as steel, automobiles and chemicals, now make up almost two-thirds of all exports (compared to about 55% in 1989).

2.45 The perception about the declining investment share of transport as a sign of under-investment does not reflect the fact that a much higher share of income has been invested in Korea since the late-1980s. At that time, the proportion of GDP that went towards capital formation increased--35% compared to 29% in the early 1980s, and 32% during the previous five years. Hence, the decrease in transport investment as a share of GDP since the early-1980s is far less dramatic (about 0.3% of GDP) than the decrease in its share of capital investment.

2.46 The sectoral investment data in Table 2-19 show that, as a share of GDP, transport investments in 1988-92 were actually higher than in 1983-87. Moreover, their expenditure share

has been rising since 1988, when they reached the lowest level of the past decade. Conversely, their shares in 1991 and 1992 were the highest over the past decade. In a quantitative sense, therefore, it is difficult to establish that aggregate transport sector investments have diminished continuously since the early-1980s.

Table 2-19: Korea: Investment in Transport Infrastructure
(current prices)

Mode	1978-82	1983-87	1988-92	1992
(percent of total)				
Roads	59.2	52.6	64.8	57.6
Motorways/Trunk Roads		32.5	35.9	33.8
Local Roads		20.1	28.9	23.8
Rail	25.2[1]	10.3	11.2	13.7
Port	14.3	12.2	9.1	8.0
Airport	1.2	3.5	2.5	3.2
Subway	--	21.5	12.6	17.5
Total Investment (billion Won)	4,107	8,132	22,607	7,747
Total Investment (percent of GDP)	2.1	1.9	2.6	3.3

Source: Bank of Korea, *National Accounts*, various issues; and Shon (1993).
1. Includes subway expenditures for this period.

2.47 However, two other factors may contribute to the popular belief that investment has fallen. One is the lack of improvement in travel conditions because growth in demand has offset the expansions. Second, land prices absorb a larger share of expenditures on roads; thus, investment expenditures increase capacity less than in former years (when land prices were lower).

2.48 **Modal Shares of Investment.** Over the 1980s, investment in roads continued to be dominant, accounting for between half and two-thirds of transport investment since 1983. Moreover, its share in 1988-92 rose relative to the preceding five years (Table 2-19). This increase occurred primarily at the expense of subways, reflecting the slowdown in subway construction immediately following the completion of the new lines in Seoul and Pusan. However, since 1992, capital expenditures on subways have risen once again, largely reflecting the expansion of the Pusan system and initiation of the Taegu system. The share of ports has also declined, particularly in 1990-92. Finally, the share of rail investment slightly increased in 1988-92, and this trend was particularly marked during the past three years.

2.49 **Sources of Investment.** Almost all investment in transport infrastructure is undertaken by the central and local governments or by public corporations. The shares of these three sources (in terms of their direct contributions) are shown in Table 2-20, which further disaggregates these investments by transport mode. These data illustrate what appears to be a dramatic and continuous shift of expenditures since 1980, away from the central Government and towards local governments and public corporations: For example, the Government directly financed almost three-quarters of transport infrastructure investment in 1980 but only about a third in 1991. At the same

time, the local government share more than doubled to almost half of sectoral investment, while the public corporations' share almost quadrupled, to about 20% of the total. These data also show that the apparent shrinking role of Government was experienced primarily in the rail sector where more of these investments are now being made by KNR and KLDC (for the new towns).[2] The expansion in local government shares reflects both the expansion of capital expenditure on local roads as well as a significant share of subway investments.

Table 2-20: Korea: Investment in Transport Infrastructure by Source
(Percent of total investment; current prices)

Source		1980	1985	1986-90	1991
Central Government		73.1	61.0	55.4	33.4
of which:	Road (Motorways and Trunk Roads)	20.8	26.9	30.8	21.5
	Rail	27.1	10.5	7.6	4.8
	Port and Airport	20.0	12.9	10.8	4.7
	Subway	5.2	10.7	6.3	2.4
Local Government		22.7	31.5	34.2	46.7
of which:	Road (Local including Metropolitan roads)	22.7	25.2	27.1	35.0
	Subway	-	6.3	7.1	11.7
Other (including Public Corporations)		4.2	7.5	10.4	19.9
of which:	KHC (Roads)	3.4	3.4	5.5	9.4
	KMPA, KAA, and Private (Ports and Airports)	0.8	1.2	1.1	1.3
	KNR and KLDC (Rail)	-	2.9	3.7	9.1
Total (billion won)		580.7	1,604.8	12,893.1	5,747.6

Source: Shon (1993).

2.50 The Government share in road investments (motorways and trunk roads as well as in aggregate) remained relatively stable between 1980 and 1990 (although it fell in 1991). However, its share of rail investments, and especially of subways, appears to have fallen sharply over the decade, and particularly in 1991. (These trends in the financing of investments are shown more sharply in Table 2-21, which classifies them also according to mode). But the recent expenditures by public corporations have been financed by short-term debt, which may ultimately have to be absorbed by the Government; thus, the Government share may be higher than is suggested in Table 2-20. The fiscal and financial implications of this tendency to shift expenditures to local governments and public corporations are examined in detail later.

[2] The expenditures by public corporations might be financed directly or indirectly by the central Government through debt restructuring.

Table 2-21: Korea: Transport Investment by Mode; by Source
(Billion Won, current prices)

Mode	1980	1985	1986-90	1991
Road				
Motorways and Trunk Roads	140.3	486.1	4692.2	1778.0
of which (%):				
Central Government	85.9	88.9	84.8	69.5
KHC	14.1	11.1	15.2	30.5
Local Roads (including Metropolitan)	131.8	404.3	3495.7	2013.0
of which (%):				
Local Government	100.0	100.0	100.0	100.0
Total Roads	272.1	890.4	8187.9	3791.0
of which (%):				
Central Government	44.3	48.5	48.6	32.6
Local Government	48.4	45.4	42.7	53.1
KHC	7.3	6.1	8.7	14.3
Rail	157.4	214.2	1447.2	798.7
of which (%):				
Central Government	100.0	78.6	67.2	34.2
KNR and KLDC	-	21.4	32.8	65.8
Subway	30.0	274.0	1718.0	810.1
of which (%):				
Central Government	100.0	62.8	46.9	17.3
Local Government	-	37.2	53.1	82.7
Port and Airport	121.2	226.2	1540.0	347.8
of which (%):				
Central Government	96.0	91.2	90.5	78.1
KMPA, KAA and Private	4.0	8.8	9.5	21.9

Source: Shon (1993).

Has There Been Underinvestment in Transport Infrastructure?

2.51 Although Korean policy-makers increasingly perceive that the country has not invested sufficient amounts in transport infrastructure during the last decade, this is difficult to evaluate. One difficulty is that none have clearly defined what would be considered a desirable level. Despite uncertainties, data suggest there is *not* a strong case to show substantial underinvestment.

Transport Investment and Economic Growth

2.52 Trends in public transport investment are important because a number of analysts believe there is a link between public infrastructure investment and economic growth, particularly in the United States. The most common approach has been to estimate time-series relationships between productivity estimates (such as total factor productivity) and infrastructure investments (either all public investment or that made in sectors such as transport, power and water supply). If these relationships are strongly positive (implying high rates of return to public infrastructure investments that exceed those normally associated with private investment), it is taken to mean that public infrastructure capital stocks are deficient.

2.53 The initial research in this area (using public investment data for the United States) was by Aschauer (1989), who found surprisingly high rates of return (of the order of about 60%) to public infrastructure. Similar results (although generally showing lower rates of return) were obtained in more recent work on the United States, OECD and Japan, that use aggregate as well as sectoral measures of public investment. These results underpin the argument that the role of infrastructure spending has been seriously undervalued even in industrial countries.

2.54 A recent study--Uchimura and Gao (1993)--applied a similar framework to Taiwan (China), and Korea. As with Aschauer's study of the U.S., it found extremely high rates of return to investment in public infrastructure (including transport)--77% for Taiwan (China) and 51% for Korea. Another study, Canning and Fay (1993), restricted itself to estimating the relationship between economic growth and investment in transport infrastructure. The estimated rates of return it found on road building varied systematically with countries' per capita incomes. In particular, while they were in line with those for other forms of capital in high-income countries, and not very high in low-income countries, they were huge in rapidly industrializing countries such as Korea, ranging between 100% and 300%.

2.55 However, there remain serious doubts as to the interpretation of these high rates of return. First, there is now almost as impressive a collection of empirical results concerning the relationship between productivity growth and infrastructure investment, which finds rates of return to infrastructure either much lower or almost the same as for non-infrastructure investments[3] (see Box 2.1).

2.56 These divergent empirical results also expose the second and most serious flaw of this methodology, which is its weak theoretical basis. Most empirical estimates ignore the two key aspects of infrastructure investments such as those in transport. Specifically, these facilities are public goods that are prone to congestion beyond some point. Further, they involve lumpy investments in interlocking networks. These features imply at least two reasons why simply estimating relationships between productivity growth and infrastructure investments could lead to misleadingly large results. First, such results confuse correlation with causality. Although output growth and infrastructure investment would be expected to move in step, this may be due to another common factor rather than the influence of infrastructure on growth. Second, causality likely runs in both directions rather than only from higher infrastructure investment to more rapid growth. This so-called endogeneity problem in conjunction with the lumpiness of investment also would exaggerate estimated rates of return.

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[3] See, for example, Hulten and Schwab (1991) and Holtz-Eakin (1992) for such results in the context of industrial countries.

Box 2.1 Returns on Infrastructure Investment--Too Good to Be True?

Recent studies in the United States suggest that the impact of infrastructure investments on economic growth represents startlingly high rates of return (up to 60 percent). Too good to be true? Possibly. The results presented in the table below may overestimate the productivity of infrastructure for two reasons. First, there may be a common factor that causes growth in both output and infrastructure that is not included in the study. Second, it may be that growth leads to infrastructure investment, and not that investment produces growth. A number of studies have found that causation runs in both directions. Yet more sophisticated estimates that address these issues either have concluded that the positive results were not much affected by different econometric methods or have found no noticeable impact of infrastructure on growth. Neither finding--of an extremely high impact or of a negligible impact--is entirely credible, and research efforts continue in an attempt to refine the methodology.

An alternative approach estimates the impact of infrastructure on production costs. Studies (summarized in Aschauer 1993) found that infrastructure significantly reduces production costs in manufacturing in Germany, Japan, Mexico, Sweden, the United Kingdom, and the United States. One estimate suggests that three-quarters of U.S. federal investment in highways in the 1950s and 1960s can be justified on the basis of reductions in trucking costs alone.

While there is still no consensus on the magnitude or on the exact nature of the impact of infrastructure on growth, many studies on the topic have concluded that the role of infrastructure in growth is substantial, significant, and frequently greater than that of investment in other forms of capital. Although the indications to date are suggestive, there is still a need to explain why the findings vary so much from study to study. Until this problem is resolved, results are neither specific nor solid enough to serve as the basis for designing policies for infrastructure investment.

Sample	Elasticity[a]	Implied Rate of Return[b]	Author/Year	Infrastructure Measure
United States	0.39	60	Aschauer 1989	Nonmilitary public capital
United States	0.34	60	Munneli 1990	Nonmilitary public capital
48 states, United States	0	0	Holtz-Eakin 1992	Public capital
5 metro areas, United States	0.08	--	Duffy-Deno and Eberts 1991	Public capital
Regions, Japan	0.20	96	Mera 1973	Industrial infrastructure
Regions, France	0.08	12	Prud'homme 1993	Public capital
Taiwan, China	0.24	77	Uchimura and Gao 1993	Transportation, water, and communication
Korea	0.19	51	Uchimura and Gao 1993	Transportation, water, and communication
Israel	0.31-0.44	54-70	Bregman and Marom 1993	Transportation, power water, and sanitation
Mexico	0.05	5-7	Shah 1988, 1992	Power, communication, and transportation
Multi-country, OECD	0.07	19	Canning and Fay 1993	Transportation
Multi-country, developing	0.07	95	Canning and Fay 1993	Transportation
Multi-country, OECD and developing	0.01-0.16	--	Baffes and Shah 1993	Infrastructure capital stocks
Multi-country, developing	0.16	63	Easterly and Rebelo 1993	Transportation and communication

[a] Percentage changes in output with respect to a 1 percent change in the level of infrastructure.
[b] Ratio of discounted value of increase in dependent variable to discounted value of investment in infrastructure.

Source: World Development Report 1994: Infrastructure for Development.

2.57 A host of recent econometric studies have confirmed both these criticisms by showing how much the results change if various adjustments are made in the data or model specifications.[4] This report illustrates that even with seemingly sophisticated techniques, it is exceedingly difficult to develop and apply a macroeconomic framework capable of addressing and resolving the issues regarding under-provision of infrastructure.

2.58 Hence, it is worth relying on the simpler (although less satisfying) approach of comparing the shares of GDP invested in transport infrastructure in Korea with those in other countries with similar circumstances (Taiwan, China and Japan). The share of investment in transport in Taiwan, China is shown for the last two decades in Table 2-22 below. Comparing these shares to those for Korea (in Table 2-19 and Table 2-22) shows no clear relationship. In Taiwan, China, the ratio of investment in the transport sector has never risen above 3.5% of GDP, and fell below 2% in the early-1980s. This share is comparable to the share in Korea during the early-1980s (Table 2-19 and Table 2-22). Although it was higher than in Korea in 1978-82, this difference partly reflects the inclusion of telecommunications investments (unlike the Korean data). However, the share of transport in Korea during 1988-92 is far higher. Comparable data for Japan are available only for 1952-64 (also shown in Table 2-22). This period, though, is more appropriate to a comparison with Korea since it was before Japan achieved industrial country status. As Table 2-22 illustrates, the share of transport investments in GNP was 2.1%-2.8% during this period, which is similar to its share in Korea during 1978-92.

2.59 The conclusion that emerges from this comparison is that it is difficult to make a clear-cut case about underinvestment in transport infrastructure in Korea during the past decade. Undoubtedly, there were periods such as during 1986-88 when transport investment fell as a share of GDP and gross investment. However, such fluctuation in the share of infrastructure investment of various types is to be expected as mentioned earlier, given its lumpy nature.

Table 2-22: Transport Investment Shares -- Japan, Taiwan (China) and Korea

	1952-54	**1955-59**	**1960-64**	
Japan (percent of GNP; 1960 constant prices)	2.1	2.1	2.8	
	1973-77	**1978-1982**	**1983-87**	**1988-92**
Taiwan, China[1]	2.9			
(percent of GDP; current prices)	3.5		2.0	2.3
Korea	n.a.	2.1	1.9	2.6

Source: Shon (1993), Asako (1994), and Reinfeld (1994).

1. Investment share of transport and telecommunications.

2.60 Caution is also warranted in interpreting the high rates of return derived from applications of the macroeconomic approach that relates productivity growth to infrastructure investment. While many of these exercises show high rates of return to additional investment, these estimates must be viewed as tentative. The theoretical foundations of this approach are still weak and more reliable estimates must await the development of more refined techniques. Finally, the problems with applying an aggregated framework of this sort also confirms the need to use sound

[4] See, Hulten (1993) for a discussion of these points.

microeconomic analysis in the form of cost-benefit studies (despite their limitations) when selecting and designing transport projects. Implicitly, such a bottom-up approach will provide a more robust answer to the question of whether Korea (or any other country) is investing the right amount in its transport infrastructure.

D. Conclusion

2.61 The rapid growth of population and income has been accompanied by rapid increases in nearly all types of transportation. Substantial investments have been undertaken, but demands threaten to outstrip supply. Major expansions in transport capacity are planned, and these will impose a serious financial burden. Subsequent chapters explore the extent to which reformed pricing policies can ration the excess demand, improve efficiency in the use of infrastructure and resource allocation, and provide the financing needed for infrastructure expansion.

III. PLANNED TRANSPORT INVESTMENT AND RESOURCE NEEDS

3.1 This chapter presents the Government's transport sector strategy for the current plan period (1993-97) and the investment plans that underpin it. The second section examines the financing needed, assuming unchanged pricing policies and institutional conditions. In this sense, it presents the "base case" scenario regarding the financing of additional transport investment. The final section assesses the financing gap and what must be considered to bridge it.

A. Government Plans for Transport Infrastructure

Economic Growth and Transport Demand Projections

3.2 After President Kim Young-Sam took office in 1993, he replaced the existing Seventh Five-Year Plan (1992-96). The plan--the New Five-Year Economic Plan (NFYEP)--was finalized in June 1993, and now serves as the framework for Korea's medium-term development, covering 1993-97. The NFYEP aims to establish the foundation for Korea to become an industrialized economy by the end of the century. To achieve this goal, the Plan envisages policies to enhance growth potential and strengthen international competitiveness, improve social welfare (including equity and environmental quality) and promote economic liberalization.

3.3 The macroeconomic prospects over the next three years are summarized in Table 3-1, along with data for 1993 and 1994. The projections for 1995-97 are roughly consistent with the Government's forecasts contained in the NFYEP. As shown, the economy is expected to recover from the current economic slowdown with GDP growth in 1995-97 projected at 7% per annum. This is based on the gradual economic recovery that began in the latter part of 1993, which resulted in GDP growth in 1994 of 8%. The projected GDP growth rates would be underpinned by export growth of about 8% annually (which is slightly slower than in 1991-93), and investment growth of almost 8% per annum. The share of investment to GDP is therefore expected to remain constant at about 36% in 1994-97 (from its peak of almost 39% in 1991), roughly in balance with the national savings rate. Consequently, the current account is expected to remain roughly in balance. With the success of recent stabilization efforts, consumer price inflation is anticipated to remain below 6% over the period, declining to about 5% by 1997.

3.4 As the economy continues to expand, demand for transport services--passenger and freight--should continue to grow rapidly. The Government expects passenger traffic to increase by about 5% per annum during the 1993-2001 period. The most rapid expansion is expected in subway and suburban rail traffic (about 15% a year) and in domestic air travel. Domestic freight traffic is expected to increase at about 6%, while air and railway freight also will expand rapidly--each at about 10% a year. Finally, with rising affluence, international air passenger traffic is anticipated to expand by about 10% annually.

3.5 The main goal of transport strategy during the NFYEP period and until 2001 is to expand capacity sufficiently to accommodate the increase in demand that would arise from rapid

3.5 The main goal of transport strategy during the NFYEP period and until 2001 is to expand capacity sufficiently to accommodate the increase in demand that would arise from rapid economic growth and the need to enhance industrial competitiveness. In these respects, the aims of the strategy are the same as in preceding periods. To achieve these goals, ambitious physical investment targets have been set (until 2001) for all transport modes. For example, all highways are to be paved (from the current proportion of 89%). Further, the length of the national and provincial road network is to be expanded by about 10%. On railways, the proportion of electrified trains and of double-track rails is to be doubled, and a high-speed rail will operate between Seoul and Pusan. New commuter rail systems are to be built to connect Seoul with the newly constructed cities on the outskirts and large portions of the existing commuter rail facilities are to be double-tracked. Ambitious expansion plans exist for subways--with new lines to be added to the existing systems in Seoul and Pusan--and new systems to be built in the four other cities with populations greater than one million. A new international airport is to be constructed to serve Seoul, and airports in the other major cities are to be expanded. Finally, container handling facilities are to be added at the major ports.

Table 3-1: Economic Trends and Projections 1993-1997

			Projected		
	1993	1994	1995	1996	1997
GDP growth (%)	5.5	8.0	7.0	7.0	7.0
CPI inflation (%)	4.7	5.5	5.0	5.0	5.0
Consumption growth (%)	5.8	6.0	5.7	5.6	5.6
Investment growth (%)	0.6	10.0	7.5	8.0	8.0
Export growth (%)	9.0	8.0	8.5	8.0	8.0
Import growth (%)	6.5	6.5	6.5	6.5	6.5
Exports of goods and services (US$ billion)	99.2	108.7	119.8	131.3	143.9
Imports of goods and services (US$ billion)	99.3	107.5	117.7	128.8	141.0
Resource balance (US$ billion)	-0.1	1.2	2.1	2.4	2.9
Current account balance (US$ billion)	0.5	1.4	2.3	2.6	3.1
(% of GDP)	(0.2)	(0.4)	(0.5)	(0.6)	(0.6)
External debt/GDP (%)	14.9	12.8	11.1	9.6	8.3
Debt service/Exports (%)	9.2	8.0	7.1	6.3	5.6

Source: Ministry of Finance and Economy; World Bank Staff estimates.

The Transport Investment Plan

3.6 The Government's transport strategy outlined above has been expressed in the form of a plan for sectoral investments, which is further disaggregated according to transport mode. However, it should be noted that this plan does not represent firm commitments to undertake these

ministries and public corporations. In the past, these intentions have typically been much more ambitious than the actual level of transport investment. For instance, the ratio of actual investment to planned transport sector investment during the fifth plan period (1982-86) was only about 57%.[1] However, despite this tendency, it is still worth examining their consistency with projections of total savings and investment, and their implications for macroeconomic balance.

3.7 The proposed total investment in transport infrastructure (W76.2 trillion) for 1993-97 is shown in Table 3-2 (in 1993 prices); it involves substantial increases in total investments at the aggregate level, as a result of which the ratio of transport infrastructure investments to GDP is projected to rise to almost 6% by 1997, and average over 5% during the period. The scale of the increases being envisaged can be seen by comparing these levels with the average ratio of transport investments to GDP during 1983-92, which was about 2.4%.[2]

Table 3-2: Projected Investment in Transport Infrastructure
(1993 prices)

Mode	1988-92	1993	1994	1995	1996	1997	1993-97
(percent of total)							
Roads	64.8	57.2	53.9	54.4	54.2	58.1	55.6
Motorways/Trunk Roads	35.9	27.1	23.3	25.4	27.3	32.3	27.5
Local Roads	28.9	30.1	30.6	29.0	26.9	25.8	28.1
Rail	11.2	12.4	16.8	20.7	21.4	18.8	18.6
Port	9.1	5.1	5.5	5.4	4.9	4.1	4.9
Airport	2.5	3.3	6.5	5.5	4.8	3.6	4.7
Subway	12.6	22.0	17.3	14.0	14.9	15.5	16.2
Total Investment (W billion)	22,607	9,909	13,054	15,499	17,938	19,844	76,244
Total Investment (as percent of GDP	2.6	3.9	4.8	5.3	5.7	5.9	5.2

Source: Shon (1993).

3.8 Table 3-2 also shows the investment plan for 1993-97 disaggregated by transport mode. This includes substantial increases in the investments on each of the individual modes as well as in the total investment. As in the past, road investments account for the largest share and have grown sharply. However, within this category there is a shift away from local roads (including county and metropolitan roads) towards motorways and national roads. There is also an increase in the railways' share of investment, continuing the trend that began in the mid-1980s. At the same time, the share of ports would decrease. Finally, with the expansion of subways in Seoul and Pusan

[1] In 1980 prices, planned investment was W 9,940 billion while actual investment was W5,658 billion. For details of planned investment, see World Bank (1983), Statistical Appendix, Table 1.14. Actual investment figures are based on the nominal data from Shon (1993), adjusted to 1980 prices.

[2] These investment projections are drawn from Shon (1993), and differ from those compiled by the government's SOC Special Unit due to adjustments in the investment figures for the proposed high-speed rail project, the new Seoul airport and for municipal roads. For the first two categories, these adjustments increase investments so as to account for price increases due to inflation. For municipal roads, the adjustments reflect greater realism in the capabilities of local governments to undertake these investments, and therefore, reduce the investment figures.

and their proposed construction in four other metropolitan areas, the share of subway investment would rise slightly from 12.6% in 1988-92 to 16.2% in 1993-97.[3]

Table 3-3: Projected Investment in Mega-Projects: 1993-97
(billion Won; 1993 prices)

Project	1993	1994	1995	1996	1997	Total
New Expressways	691.6	974.2	1299.9	1559.2	1609.0	6133.9
High-Speed Rail	307.9	1008.8	1945.2	2109.4	2282.8	7654.1
New Seoul Airport	213.2	662.1	681.7	690.6	640.5	2888.1
Pusan Port	111.9	135.5	130.2	146.1	104.6	628.3
Total (excluding subways)	1324.6	2780.6	4057.0	4505.3	4636.9	17304.4
Share of Total Transport Investment (%)	13.4	21.3	26.2	25.1	23.4	22.7
Subway expansion (Seoul, Pusan and 4 Metropolitan cities)	2180.5	2263.9	2174.1	2670.0	3065.2	12353.7
Total (including subways)	3505.1	5044.5	6231.1	7175.3	7702.1	29658.1
Share of Total Transport Investment (%)	35.4	38.6	40.2	40.0	38.8	38.9

Source: Shon (1993).

3.9 Before examining the sources of financing, it is useful to disaggregate them further. In particular, it is worth examining what share is intended for "mega-projects"--those of a very large scale. Admittedly, any attempt to delineate these projects would be arbitrary since all investment projects are lumpy to some extent. But it is still instructive to look at the largest separately because it might be possible to postpone their implementation in order to reduce the financing burden.

3.10 The share of mega-projects in total investment for 1993-97 is shown in Table 3-3, using two definitions. The first and narrower definition includes specific expressways, one high-speed rail, the new Seoul international airport and the new Pusan port. The broader classification also includes various subway investments (for expansion of the Seoul and Pusan lines, as well as the new lines in the other cities) among mega-projects. Using either definition, Table 3-3 shows that the share of these large-scale projects in total transport investment rises over this period. This increase is especially marked with the narrower definition, where their share rises to almost a quarter

[3] There is still uncertainty as to the precise magnitude of this proposed investment program. During discussions of this report with Government, it was noted that total investment in transport infrastructure during 1993-97 was projected to be about W48 trillion rather than W76 trillion. However, it was later clarified that this lower estimate excluded investment in local roads. Irrespective of the precise magnitude of proposed investments, the macroeconomic considerations discussed below in this Chapter are still relevant, given the pressures that exist in Korea to expand transport investments.

increase is especially marked with the narrower definition, where their share rises to almost a quarter of total transport investment by 1997. This increase in shares of mega-projects is due primarily to the more than seven-fold increase in investments for the high-speed rail project between 1993-97.

B. Resource Requirements and Financing Constraints

Funding Mechanisms for Planned Investment

3.11 The sources of financing, as identified in the GOK's plans, are described and analyzed in light of historical trends. As noted in Chapter II, financing for transport infrastructure has come from three sources--central government, local governments, and to a limited degree, public corporations.

Table 3-4: Proposed Investment in Transport Infrastructure by Source
(1993 prices)

Source	1986-90	1993	1994	1995	1996	1997	Total
(percent of total investment)							
Central Government	55.4	37.5	42.7	46.2	46.8	44.4	44.1
Road (Motorways/Trunk)	30.8	21.2	18.8	22.1	23.2	27.2	23.0
Rail	7.6	7.2	10.2	13.3	12.8	7.9	10.5
Port }	10.8	3.5	3.8	3.8	3.5	3.4	3.6
Airport }		2.0	4.6	2.8	2.4	1.6	2.6
Subway	6.3	3.5	5.2	4.3	5.0	4.2	4.5
Local Government	34.2	48.6	42.7	38.8	36.8	37.0	39.8
Road (Local + Metro. Roads)	27.1	30.1	30.6	29.0	26.9	25.8	28.1
Subway	7.1	18.5	12.1	9.8	9.9	11.2	11.7
Other (incl. Public Corporations)	10.4	13.9	14.6	15.1	16.4	18.6	16.1
Roads	5.5	5.9	4.5	3.3	4.1	5.1	4.5
Rail	3.7	5.2	6.5	7.4	8.6	10.9	8.1
Port }	1.1	1.5	1.6	1.6	1.4	0.7	1.3
Airport }		1.3	1.9	2.8	2.1	1.9	2.1
Total (billion Won)	12,898	9,909	13,054	15,499	17,938	19,844	76,244

Source: Shon (1993).

3.12 The anticipated contributions of these sources are shown in Table 3-4. However, these shares represent only rough estimates. To these sources, the GOK now hopes to add a fourth--the private sector. However, no attempt has been made to predict the level of such investment, despite considerable optimism as to its magnitude once the new law governing private sector investment in social overhead capital (SOC) is enacted.

Central Government Financing

3.13 The central Government finances transport infrastructure either directly or through its transfers to local governments and public corporations. Transfers to local governments are made from the national budget, while those to public corporations take the form of equity contributions and/or loans. For Government investments in the sector, the most important sources of funds are the earmarked transport-related taxes it levies. The difference between these taxes and the Government's share of transport investments is financed from general revenues. The earmarked taxes apply almost entirely to users of motor vehicles. Their projected revenues between 1993-97 are shown in Table 3-5.[4] Increased tax rates and projected vehicle growth result in substantial growth in these revenues. While their share in total transport investment remains roughly constant over this period, they would rise consistently as a proportion of GDP. By 1997, their share of GDP will be 1.5%, more than double the average level in 1988-92.

Table 3-5: Projected Central Government Vehicle-Related Taxes (1993-97)

Tax	1993	1994	1995	1996	1997	Total
(As percent of total transport investments)						
Gasoline tax	15.5	14.9	15.3	15.7	16.5	15.7
Diesel tax	3.1	4.0	3.9	3.8	3.9	3.8
Vehicle excise tax	6.3	5.3	4.9	4.6	4.5	5.0
Total vehicle-related taxes	24.9	24.2	24.1	24.1	24.9	24.4
Total vehicle-related tax revenue (billion won; 1993 prices)	2,468	3,161	3,729	4,330	4,938	18,626

Source: KOTI and MOCT.

3.14 Since the 1993 change in the law concerning the special transportation account, all revenues realized from these transport-related taxes at the central level have been earmarked for transport investment. By contrast, until last year, 25% of all vehicle-related taxes were transferred to other uses at the local level. The new transport special account also involves one major change from earlier financing practices: It can now be used for a wider range of transport investments, and the proportions in which they are to be used for different modes can be changed each year. These arrangements contrast with those in place earlier, whereby the special account could be used only to finance investments in roads and for urban rail (subways), and these proportions were fixed.[5]

Local Government Financing

3.15 In addition to grants from the Government, local governments finance transport investments from their tax revenues, which include a substantial share of transport-related taxes. As noted in Chapter II, they are similar to those at the central level in that they apply exclusively to road

[4] These estimates assume that tax rates are raised to 150% (from the current 130%) for gasoline, remain at 20% for diesel, and demand elasticities for each fuel are -0.3.

[5] Specifically, road construction was allocated all the earmarked (75% of the total) Government tax revenues on diesel and automobile purchases, and 90% of the earmarked gasoline taxes. Urban rail received the remaining 10% of earmarked gasoline taxes.

transport in the form of purchase, license and registration taxes on cars (and some to taxis, trucks and buses). However, unlike their counterparts at the central level, these taxes are not earmarked, entering into general revenues instead. The projected revenues from these taxes, based on anticipated growth in the vehicle fleet, are shown in Table 3-6. While they increase substantially, their share in planned transport investment still falls slightly. However, as with the taxes levied by the Government, local vehicle-related taxes would also rise sharply relative to GDP from about 0.6% in 1988-92 to 1.1% in 1997.

Table 3-6: Projected Local Government Vehicle-Related Taxes (1993-97)

Tax	1993	1994	1995	1996	1997	Total
(As percent of total transport investments)						
Vehicle acquisition tax	4.0	3.6	3.5	3.5	3.6	3.6
Registration tax	6.8	6.2	6.2	6.2	6.4	6.3
Road tax	9.0	8.2	8.0	8.0	8.2	8.2
License tax	0.9	0.8	0.8	0.8	0.8	0.8
Total vehicle-related taxes	20.7	18.7	18.5	18.5	19.0	18.9
Total vehicle-related tax revenue (billion won; 1993 prices)	2,049	2,446	2,869	3,310	3,770	14,444

Source: Shon (1993); staff estimates.

3.16 The likelihood of local government participation in transport investment at the levels contemplated in current plans appears remote. Between 1983-91, transport absorbed an annual average of 6.8% of municipal expenditures (Shon, 1993, p.31), ranging from a low of 4.8% in 1988 to a high of 12.7% in 1984. However, in order to sustain the pace of investment envisioned at this time, transport's share of municipal outlays would have to rise to an average of 11% over the next five years (Shon, 1993, p.32). Less than one-half the funds anticipated to be spent by localities would be derived from transport-related taxes, with the balance depending on general appropriations or, presumably, municipal debt.

3.17 Besides financing transport expenditures from general tax revenues, the metropolitan governments of Seoul and Pusan also borrow to finance their subway systems, by issuing subway construction bonds.[6] All buyers of new cars in these metropolitan areas must purchase these bonds, as must many real estate developers. The outstanding amounts on these bonds have risen dramatically during the last decade, and especially since 1987, reflecting the systems' expansion. The total outstanding amount by late 1992 was about W1,400 billion, an increase of over 28% annually since 1987. As these must be repaid, they are a major financing concern over the coming years.

[6] This five-year bond is essentially a "balloon" loan from car owners (or property developers) to transit. It usually carries a substantially lower interest rate than the market rate (6%), and thus its value is eroded by inflation. In this sense, at least a part of the bond is a *de facto* tax on car owners and property developers for the benefit of the transit system.

Government Operating Branches and Public Corporations

3.18 The major Government branches operating in the transport sector are KNR and KMPA, while the major public corporations are KHC, KAA and KCTA. In addition, a new public corporation has been formed to build and operate the Seoul/Pusan high speed rail line, and the KLDC underwrites a wide variety of road and rail improvements through its development of infrastructure to support new satellite cities and industrial parks (see Annex 3.2 for a more detailed review of investment and financing trends of public transport corporations).

3.19 In recent years, there has been a down-loading of responsibility for transport investment from the Government to local governments and public corporations. This trend will most likely be reversed over the next five years as the Government has to assume the corporations' existing debt or increase its equity in the corporations (see Table 3-4). For example, the Government forgave W1.5 trillion in KNR debt during 1993 and has accepted responsibility for W60 billion in debt service for the Pusan subway in 1994. Moreover, higher revenues from user fee hikes or growth in demand may be absorbed by recent debt obligations, rather than providing new sources of funds for future investment--leading to ever more debt.

3.20 Few generalizations can be made regarding public corporations. The experience in cost recovery through user fees, reliance on debt, and investment of public equity (grants) varies substantially from corporation to corporation. However, Government loans and equity constitute the majority of investment resources for most public corporations. This is a direct result of price regulation, cross-subsidies and Government intervention in operational and investment planning. While much of the public policy intervention is intended to advance social or economic objectives for selected population groups or industries, the frequent separation of pricing decisions from market factors has severely restricted the role of pricing in managing demand for transport services, generating investment resources, and helping optimize the allocation of scarce capital through corporate management decisions.

3.21 While the share of transport investment for public corporations increased from 7.5% in 1985 to almost 20% in 1991, the numbers are distorted by the performance of KHC, whose level of investment increased tenfold. However, the increase was financed largely by short and long-term debt that boosted KHC borrowing from W106 billion in 1988 to W2,100 billion in 1992. This debt is imposing a fiscal strain, particularly since about one-third of the borrowing falls under current liabilities. Therefore, the extraordinary build-up in KHC capital outlays does not appear to be sustainable (see Figure 3-2), let alone capable of doubling again as is now anticipated in the five-year plan for 1993-97 (see Table 3-4).

3.22 In the case of the subways, interest expense consumes a substantial share of the overall capital budget and exceeds net operating revenues (before depreciation) by a large margin. For example, in 1992, net operating revenues at the Seoul subway were approximately one-fifth of debt service outlays, and debt service consisted of about one-fourth of total investment outlays.

3.23 In recent years, price increases imposed by KNR, KHC and the subways have improved financial performance. However, the bulk of these long-delayed tariff adjustments were needed to match revenues with escalating operating expenses, rather than generate substantial levels of new resources for capital investment.

3.24 The proposed investment by public corporations during the 1993-97 period is more than five times greater than the level of investment actually realized during the 1987-91 period. About 10% of the total anticipated will be for the construction of the high speed rail line between Seoul and Pusan. This outlay will be heavily subsidized by the Government. An additional 16% of transport investment is slated for subway construction, virtually all of which will have to be financed from central and local government grants.

3.25 KHC's fiscal capacity is severely limited at this time due to its extraordinary build-up of short- and long-term debt, as well as the large disparity between current revenue levels and the costs of building new facilities and widening existing routes. Ports are well positioned to cover increasing proportions of investment from rents under a new operating structure to be introduced in 1996. However, the projected outlays on ports will be less than 5% of planned transport investment during the 1993-97 period. KAA's investment needs for the New Seoul Metropolitan Airport (NSMA) and improvements at other airports are well beyond the revenue-generating capacity of the Government agency; thus, heavy government equity infusion will be needed, even if pricing adjustments to match fees in other countries are permitted.

3.26 Therefore, while demand growth remains strong in all modes due to economic expansion and rising income, the potential for public corporations to generate adequate revenues to maintain an expanding level of capital investment from internally-generated sources over the next five years will be limited unless substantial pricing adjustments are made. Now that capacity limits are being reached, current pricing practices will require substantial adjustment simply to keep pace with rising operating costs and anticipated debt service requirements.

Private Sector

3.27 Historically, private sector investment in transport infrastructure has been limited, largely due to Government regulation of pricing and the mismatch between long-term investment and short-term financing. The bulk of private sector investment has been in ports and airports, and has generally involved self-financing of single-user facilities. For example, KAL built a passenger terminal at Kimpo Airport which it now utilizes on a rent-free basis.

3.28 On the other hand, Korea's public sector has "captured" substantial benefits for transport investment from real estate development (of the sort associated with private sector activity in other countries). The KLDC develops satellite cities and industrial estates and normally provides rail and road infrastructure from the proceeds of profits generated from land sales. The Seoul Development Corporation performs a similar function with regard to urban redevelopment projects affected by Seoul Subway construction and contributes about 5% of the capital investment required for the current expansion program. Increments in land value attributable to transport investments, changes in use and improved accessibility are subject to extensive taxation which "captures" these benefits to partially offset public expenditures.

3.29 The ability to attract meaningful levels of private investment to transport projects in the future will depend on the extent to which pricing can be deregulated, financial market reforms can result in the opportunity for "project finance" transactions rather than signature credits, and cross-subsidy policies are replaced by more transparent mechanisms.

3.30 The proposed privatization structure for SOC projects discussed in Chapter VI remains heavily weighted toward the use of real estate profits to subsidize transport investment. It is unclear how much additional resources this will generate, given the public entities' existing tools for capturing real estate value. The proposed loan guarantee fund appears to be a strong incentive to encourage market pricing and deregulation of tariffs. However, market pricing strategies could affect the demand assumptions underlying current investment plans and result in alternative scenarios for project selection and timing of construction.

Financing Gap for Planned Investment -- The Macroeconomic Issues

3.31 The preceding review of the financing sources for the Government's planned transport investments from 1993-97 demonstrates a substantial gap between the planned investments and the funds available from transport-related taxes and revenues of public corporations (if current pricing practices are maintained). Therefore, it is worth considering the macroeconomic issues raised by this plan and the resulting gap. If the proposed plan is realized, an additional 3% of GDP (on average) would be channelled into the transport sector, compared with the preceding decade (Table 3-3). However, raising the share of transport investment by this magnitude in such a short period could pose difficult challenges for macroeconomic management, and this section illustrates the trade-offs.

The Risks of Overheating

3.32 It should be stressed at the outset that there are no inherent problems with financing the residual investment program (which cannot be funded through transport sector revenues) from general taxes or domestic and foreign borrowing. The only relevant concern in that case would be to ensure that all projects in the investment program have acceptable rates of return. However, the existence of a gap of this magnitude (between 2%-3% of GDP), which is to be financed from general revenues, does have implications for macroeconomic management.

3.33 In particular, if financed by taxes or domestic borrowing, aggregate expenditures elsewhere in the economy would have to be reduced by the same amount if inflationary pressures are not to be exacerbated. Hence, private or public consumption, public investment in sectors other than transport, and private investment would together need to fall by about the same proportion as the proposed rise in transport investment, unless external borrowing were expanded.

3.34 But reducing any of these expenditures by this amount in a short time span, as is proposed in the plan, presents political and economic tradeoffs. Private consumption in Korea is still low compared to other countries at its income level -- or put another way, private savings remain extremely high. Therefore, reducing it even more is unlikely to be feasible or popular. Also, the returns to public non-transport investments may be as high (or higher) because of the perception that Korea lags in the provision of a variety of public services, including health, education and non-transport infrastructure. Financing the gap with domestic borrowing would raise interest rates, thereby crowding out private investment in other sectors. This outcome is not necessarily desirable because the proposed projects in transport might not have higher social rates of return. Because investment in manufacturing has high economic returns (as it accelerates the ongoing restructuring of the Korean economy towards higher value-added products and advanced production technologies), that transition could be slowed due to crowding-out by the proposed transport investments. In

addition, the political impact of higher interest rates could potentially damage the Government's financial sector liberalization program, of which a key component is the market determination of interest rates.

3.35 It is also argued by some analysts that such an expansion of transport sector investment could be accommodated if greater reliance were placed on foreign borrowing, as this would have the advantage that interest rates would be lower than domestic ones, and would not require a contraction of domestic expenditures. However, this option could pose additional problems for macroeconomic management in the current policy context. With the economy already operating at close to full employment, the Government could not allow these inflows to translate into large increases in the money supply. It would, therefore, face the difficult choice of whether to allow these inflows of foreign capital to translate into a nominal appreciation of the won. Although an appreciation is sensible, and probably inevitable, in Korea's current economic situation, it is also likely to be difficult politically because of its impact on labor intensive exports. If the choice were, therefore, not to allow an appreciation, by sterilizing the expansionary impact of capital inflows on the money supply, there would be no reduction in aggregate expenditures.

3.36 Hence, in all cases except where a nominal appreciation is allowed, matching reductions in aggregate expenditures would have to occur in order to maintain macroeconomic balance. If not, a current account deficit would emerge of about the same magnitude as the proposed expansion of transport investments. The implied reliance on foreign savings to finance the savings-investment gap is not, by itself, of concern in the Korean context: The large current account surpluses in the late-1980s helped reduce foreign debt substantially, and the debt-service ratio now is comfortably low. Rather, the risk in attempting to raise investment even further is that it would overheat the economy as was the case in 1990-91. During that period, a boom in construction investment without matching decreases in other components of aggregate demand led to a widening of the current account deficit, and kindled inflationary pressures. Eventually, this overheating of the economy and worsening external and internal imbalances forced the Government to tighten macroeconomic policies in 1992. While these measures successfully stabilized the economy, with inflation falling to less than 5% in 1993 and the current account coming into balance, GDP growth in 1992 fell to 4.7%, the slowest in over a decade. It was not until the second half of 1993 that the pace of recovery, especially in private investment, picked up.

3.37 Whether this scenario occurs would depend on the willingness of Korean policymakers to make the necessary adjustments in their macroeconomic policies. Clearly, making such changes is quite feasible in the context of Korea's historically sound macroeconomic management. Moreover, such a shift in expenditures would be desirable if the proposed transport sector investments were clearly superior to other expenditures. But, as noted above, each of the adjustments in response to higher transport investments has associated political and economic costs. Hence, it may be tempting for policymakers to try to increase transport investments to the extent envisaged in the plan without reducing aggregate demand elsewhere in the economy. In that event, the adverse impacts on the current account deficit and inflation would undoubtedly follow with the costs to the economy being borne later when, as is inevitable, macroeconomic policies are tightened.

A Preferred Approach

3.38 For these reasons, it may be better for the Government to pursue a *two-pronged* approach in increasing its transport sector investments. First, the macroeconomic environment calls

for sectoral investments to be increased more gradually than is envisioned in the plans summarized in the previous section. And, more emphasis should be placed on financing these investments by increasing prices of transport services either directly in the form of user charges or by raising taxes on the transport sector.

3.39 Such an approach is preferable to the investment-led approach being considered currently for several reasons. One advantage is that slowing the pace of the proposed investments while raising transport sector prices and taxes is more likely to be compatible with macroeconomic stability. Increasing sectoral investment more slowly implies that less resources need to be shifted away from other components of aggregate expenditure. And, raising taxes and prices on transport services would generate additional resources for investment. On both accounts, the risks of inflation and a widening of the current account deficit would be reduced. And, increasing transport investments more gradually would yield the added benefit of allowing the economic viability of individual investment projects, especially the mega-projects, to be scrutinized more closely.

3.40 The other advantage of this strategy is that it would enhance efficiency in the use of transport infrastructure by pricing these services at levels closer to the costs of providing them. An important reason that demand for many transport services in Korea has risen rapidly in the past decade is that most services have been underpriced. Adjusting their prices upwards has the potential for restraining demand, so that the need for additional investment is reduced.

Transport Prices and Inflation

3.41 An important rationale for controlling the price of transport services has been to control inflation: It is argued that allowing these prices to rise to market-determined levels could initiate an inflationary spiral. Given this reasoning, it is not surprising that the price of transport service over the last decade has risen less rapidly than the general price level (as measured by the CPI) (see Table 3-7). These trends also show that the divergence between the pace of CPI inflation and the increase in transport prices was particularly marked during the 1980s: The real prices of gasoline, diesel, express bus services and express train services decreased substantially between 1983-92. In part, this may have worsened congestion on many transport facilities during this period.

Table 3-7: Price Index in Real Terms--Transport Fuels and Transport Services
(Index: 1983 = 100.0)

	1983	1986	1990	1992
CPI	100.0	107.8	136.5	159.0
Gasoline	100.0	80.1	41.4	45.6
Diesel	100.0	77.1	47.9	47.7
Highway Toll	100.0	102.5	80.9	127.6
Express Bus	100.0	94.2	74.4	83.3
Express Train	100.0	92.7	84.2	72.4
Subway	100.0	146.8	133.4	146.8

Source: Shon (1993).

3.42 While this belief in controlling inflation by limiting increases in the prices of transport services is widespread in Korea, its economic logic is flawed. Even if transport prices were allowed to rise to their market levels, prices would adjust only once and there would be no reason to expect successive rounds of price hikes unless these were accommodated with monetary expansion, which the Government could choose not to do. It is instructive in this regard to look at the recent experience with interest rates. As is currently argued with respect to transport prices, it was felt that liberalizing interest rates on loans would lead to a substantial jump in their levels and accelerate inflation. These fears, which led the Government to postpone such action on several occasions, were proven unfounded following the decontrol of most interest rates in November 1993.

3.43 Apart from these direct effects on price levels, there are compelling reasons to conclude that maintaining controls on transport prices would actually exacerbate inflationary pressures rather than reduce them. Underpricing transport services has contributed to worsening congestion. The consequent rationing of service and deterioration of quality have imposed high (and rising) economic costs (for example, the road congestion costs in Table 2-7). These losses mean that the implicit prices of transport services have been much higher (and rising faster) than their artificially low, controlled levels.

3.44 The congestion that has resulted from these pricing policies has contributed to the view that Korea needs to aggressively expand its investment in transport infrastructure. However, if substantial investments were made over the medium-term without corresponding increases in transport prices and taxes, inflation could still be the result. Without such adjustments, no switching of expenditures from consumption to investment would occur, and the expansion of aggregate demand would result in macroeconomic conditions resembling those in 1990-91, with rising inflation and a wider current account deficit likely. While a widening fiscal deficit is unlikely to be a concern in the short-term (given the current fiscal surplus), the fiscal implications of this strategy would be worrisome in the medium term. Hence, financing the additional investment by raising transport prices and taxes would actually make inflation less likely rather than more likely.

Estimating the Financing Gap

3.45 The notion of revenue shortfall requires making assumptions about the proportion of planned outlays to be financed by current revenue sources compared to borrowing and the maturity of future debt obligations. The projected vehicle and fuel related tax revenues from both the central and local levels is about W33 trillion, representing about 43% of total planned outlay during 1993-97. According to the proposed investment plan (Table 3-4), the shares of contribution for remaining investments (W43 trillion) by central, local and others, including public corporations, will be around 35%, 37% and 28%, respectively. The contemplated level of local government participation appears substantially high considering that transport will absorb about 11% of total expenditures compared to an average of 6.8% between 1983-91. Similarly, the capacity of public corporations to finance major expansions or mega-projects is presently constrained (for details see Chapter VI). Actually, some of the major corporations (KHC, Seoul and Pusan subway corporations) have accumulated substantial debts over the past years. These debts, if accounted, would raise the total planned outlay by W5 to 10 trillion. Moreover, given the limited historical experience, it is unclear how much additional resources can be generated from private participation in the Korean transport sector.

3.46 Considering the uncertainty about the magnitude of financing that can be allocated from the non-transport taxes or general revenues at both the local and central government levels, and

from private sources, it seems desirable to review the planned outlay in light of the past trends of expenditures. KOTI has projected a level of investment of W63.7 trillion, more consistent with the historical trends, representing about 4.3% of GNP between 1993-97. To meet the projected five year outlays a reduction of W12.6 trillion, excluding the debt service of public corporations, or 16.5% in expenditures, would be required. Historically, the planned outlays in the Korean transport sector have been substantially lower than actual expenditures (57% lower in the preceding five year plan). The earlier discussions on the macroeconomic constraints and policy trade-offs also indicate that increasing the share of transport sector investments more gradually would be easier to accomplish because less resources need to be shifted away from other sectors.

3.47 The resource gap estimation for implementation of the five-year transport plan is purely notional given the nature of choices Government can make. Therefore, it seems critical that taxes and prices of transport services, which have been kept low in the past, should be raised to minimize the diversion of funds from other sectors. Though some part of these revenues will be absorbed by increases in operating expenditures of transport services, higher prices and taxes would improve the utilization of modes by pricing services closer to the costs of provision, while making the transport sector more attractive to private participation. Such an adjustment would also reduce excessive transport demand, thereby decreasing the need for additional investment. The level of investment through borrowing would greatly depend on the pace of the on-going financial market reforms, because the emergence of long-term borrowing instruments will reduce reliance on short-term credits, while at the same time enhancing the leveraging potential of existing revenues.

IV. PRICING AND REGULATION IN URBAN TRANSPORT

4.1 Urban transport problems in Korea are similar to those in every country, rich or poor. The issue is how to provide mobility for residents of expanding large cities. The task in Korea may be more difficult because of the combination of rapid urban growth along with rising income levels as the economy matures. Transport demands escalate rapidly, sometimes filling capacity as fast as it is built. Major urban infrastructure expansion is planned, and this poses major financial challenges.

4.2 Also, current pricing and regulatory policies have contributed to rising transport demand. This chapter reviews how these policies aggravate the urban transport problem, and how modifying them can both foster greater efficiency in transport facilities and help generate revenues needed to finance the planned infrastructure.

A. Elements of Urban Transport Planning

Urban Transport Problems and Solutions

4.3 Urban transport involves many problems and potential solutions and these vary for different size cities. For example, problems tend to worsen disproportionately as cities grow. As larger populations interact over longer distances, average trip lengths tend to increase; more land is needed to accommodate larger traffic volumes but at the same time, the opportunity cost of that land rises as cities grow. In the largest cities, primary reliance on road transport is very costly or not even feasible. Thus, public transport of various forms becomes more essential.

4.4 In addition, it must be recognized that public transport investments are very costly, as transport technology is not cheap. On a full cost basis, the costs of rail transit systems are not much different than multi-lane highways with their elaborate intersections; the difference is that road systems cannot move sufficient numbers of people in the largest cities.

4.5 Different public transport technologies are appropriate depending on city size and spatial characteristics. Bus transit, especially with bus priority lanes, can handle traffic for cities well in excess of a million people. Fixed rail technologies are appropriate only in high density corridors, and heavy rail technology is required only in the very largest and densest areas.

4.6 A further complication especially important in urban areas is the issue of externalities. Transport involves extensive interaction and interference with other travel modes. This translates into environmental impacts and congestion delays which carry external or social costs. Although individuals recognize these costs, they do not fully consider them in their individual travel decisions including when to travel and choice of mode. In the absence of policies, the cumulative result of individual decision making about urban travel results in inefficiently high levels of congestion, pollution and other social costs. Private markets and decision making are a major component of urban transport, but in many instances unrestrained market outcomes do not lead to socially optimal outcomes.

4.7 For all these reasons, planning and coordination are crucial. With inter-city transport, there are relatively few major intersections, alternate routes and alternate transport modes. Although it is important not to make major infrastructure decisions in isolation, investments in major corridors or terminal facilities (such as airports) can be made with only modest coordination with other investments. However, in urban areas, there are always many alternate routes, destinations, choices of modes and choices of travel times. Any one infrastructure investment interacts with others. A motorway link will cause traffic diversion to and from many other routes, as well as substitutions from public transit. The success of public transit investments will be heavily influenced by the degree of congestion on private transport (roads) and the level of prices perceived by motorists. Investments in urban transport require close scrutiny and a long-range coordinated plan.

4.8 The basic elements of urban transport planning include:

(a) Managing traffic systems (TSM) through engineering and policies to enhance flows of traffic (automobiles and buses) including timed traffic lights, intersection controls, turn lanes, and high occupancy vehicle lanes;

(b) Investing in facilities to expand capacity to accommodate growing traffic volumes, whether by road, bus or rail;

(c) Setting pricing policies and regulatory controls that may also be supplemented by direct regulatory controls such as banning cars from certain areas on environmental grounds;

(d) Conducting transport and land use planning that involves long-range coordination of residential and commercial development to ensure consistency between land use, zoning and transport systems; in some cases, transport investments or policies might be used to influence land use.

4.9 In this chapter, special emphasis is placed on pricing policies, partly because Korea is already pursuing (a) and (b): Traffic management and controls are already in use, and major investments in urban transport capacity of various types have been undertaken with more planned. The importance of (d) is appreciated by authorities, although the skills needed are still being developed, especially in local governments. But more important is the under-used and under-appreciated role of pricing policies for attaining efficient use of various urban transport modes.

4.10 Past transport pricing policies often emphasized restraining price increases as part of an anti-inflation policy (see Chapter V). But the result has been to further stimulate the growth in transport demand, hence aggravating congestion and delays and necessitating larger infrastructure investments than would otherwise be needed. Further, if prices do not reflect the true costs of various transport modes, then distortions occur in the choice of travel mode, which ultimately result in higher costs to the economy. Finally, such practices weaken the financial position of transport enterprises, making it more difficult to finance needed expansion and thus placing larger claims on the Government's general finances. Thus, improved pricing can restrain demand growth on congested facilities, harness individual decision-making in allocating traffic most efficiently among modes, and generate financial resources to help expand capacity.

Urban Planning Frameworks

4.11 An institutional complication in urban planning is the overlapping of various levels of government. Central governments have greater taxation and resource allocation abilities, hence their involvement is necessary for large-scale investments. At the same time, they face tradeoffs between urban and non-urban transport, as well as tradeoffs with non-transport expenditures. Regional and local governments are closer to urban problems and must answer to local citizenry, but typically they are limited in taxation and planning powers. But devolution of power is not a solution either because individual districts in urban areas often can gain at the expense of their neighbors, such as calling for traffic to be routed through neighboring districts rather than one's own.

4.12 Decentralization of functions to municipalities places considerable strains on municipal government, both at the political and technical level; and, the further delegation of responsibilities to the district level, which are only beginning to have transport responsibilities, will require extending local planning skills and adequate funding arrangements (municipalities and districts--within them--are the two levels of local government in Korea. In Seoul, for example, there are 22 districts in the lower level of the hierarchy).

4.13 The future allocation of responsibilities between levels of government has not been firmly determined. Managing transport systems and transport demand will become a city function, while some local traffic management and improvement programs (including adjustment of local roads) will become district functions. Implementation of some municipal or national policies (such as the car shift system) will also be delegated to the districts.

4.14 At the political level, city councils were only formed four years ago, and do not appear yet to have developed any strategic planning capability. For example, in connection with setting public transport fares, Seoul and Pusan do not appear to have established any policy. Seoul Development Institute is being asked for advice, and it appears that KOTI will also be involved; but there is little guidance from the political level over the principles and objectives on which the advice should be based.

Directions of Korean Urban Transport Policies

4.15 The provision of housing has been an issue of high priority in Government policy. The combination of green belt policy and the strongly centralized control over development in a context of land shortage and very high prices of land released for development, have led the Government to approach location decisions in great secrecy. The consequence appears to have been that the transport implications of the proposed new developments have had to be considered very hastily. The five new sites planned on the periphery of Seoul as apartment towns for a population of two million will put extra pressure on both public transport and road facilities in the affected corridors.

4.16 The Urban Transport Action Plan that MOCT announced in September, 1993, contained a number of measures aimed at reducing road congestion. It stressed the need for demand management measures, expansion of urban mass rail transit, and improvements in bus service as the core of the Korean urban sector policy. More bus lanes are to be introduced in the major cities, design of lanes improved and enforcement tightened. Also, bus routes will be restructured to serve subway stations; some HOV lanes will be introduced; working times will be staggered and, about

600 km of bicycle routes are planned by 1997, with improved parking facilities and protection offered to make cycling safer.

4.17 The most striking measures are the subway plans. Subway networks will be increased from a total of 267 km in 1992 to 617 km in 1997 which is expected to increase the subways' share of passenger movement in Seoul from the present 25% to 40%-50%. The share was similarly forecast to rise in Pusan from 8% to 21% and in Taegu from zero to 18%. However, even increases in the subways' share in the cities are unlikely to reduce road congestion because the growth in road traffic will soon fill up the spare capacity created by road users diverted to the subways.

4.18 In practice, the most notable feature of the plans is the continuing emphasis on increasing capacity as a way to close the demand gap. While authorities propose to reduce on-street parking in the major cities, in Seoul this is to be accompanied by an almost doubling of the total public parking lots from 360,000 spaces in 1993 to 650,000 in 1997, and by incentives to private parking operators to construct more parking lots.

4.19 While the above elements are certainly desirable, they will be inadequate to prevent further deterioration of travelling conditions unless some parallel actions are taken on the pricing and regulatory front. Although an increase in the tax rate on gasoline from 109% to 150% is proposed, this represents an increase of only 20% in the real costs of car use, which could well be offset in generalized cost terms if the parking policy aims are achieved. Further, an overall increase in fuel taxes, which might be justified in terms of overall cost recovery (see Chapter V), does not adequately reflect the increase in the costs imposed on society by users in the most highly congested areas and periods.

B. Present Pricing Practices and Regulatory Policies

Price Controls

4.20 In general, urban transport prices have been tightly controlled. With public enterprises operating in the transport sector, prices have been set directly by the sponsoring ministry (MOCT in the case of highways and for the services) after consultation with, and with the approval of MFE. For regulated private sector activities (bus and taxi services), fares have also been set at the national level by MOCT with the approval of MFE. The current tariff structure for most services is based on covering average costs, with prices kept uniform throughout the country. In both the private and public sectors, applications for price increases can be made on the basis of cost changes.

4.21 The basis for centralized control is to restrain transport prices as an important anti-inflationary instrument; the legal basis for the MFE role is the Price Stabilization and Fair Trade Act. As part of the policy of decentralization, the powers for setting bus and taxi fares were shifted to the local level in July, 1994 (thus, in principle, allowing them to be set at different levels in different cities). However, the MFE role has not been abandoned, and it remains to be seen whether the formal decentralization actually introduces more flexibility.

4.22 Under this regime, the real prices of most modes of urban transport, except subways, have been falling. However, as Table 4-1 shows, the usage costs of private transport (excluding the

costs of car ownership and parking) have fallen even more, when compared to those of public transport. The extent of the relative change is in fact understated because premium taxi and bus services (and thus more costly) were introduced. Moreover, as incomes have risen, transport costs have also fallen in relation to real income.

Table 4-1: Trends in Real Prices for Urban Transport in Korea
(1991 = 100)

Year	Private Car		Standing Bus	Seat Bus	Subway	Small Taxi
	Gasoline	Tolls				
1975	191.7	124.6	91.4	--	71.0	122.7
1980	286.5	100.5	106.4	128.3	64.3	127.9
1985	197.2	96.3	100.6	106.1	96.9	110.8
1990	85.6	81.6	90.1	93.1	87.6	98.0
1991	100.0	100.0	100.0	100.0	100.0	100.0
1994	124.0	88.9	201.3	134.0	130.6	133.5

Source: E. Shon, *Transport Related Prices*, Paper presented at the seminar on transport infrastructure expansion. Seoul, December, 1991.

4.23 With regard to the costs of vehicle use, the margin between the fuel producers' price and consumer prices (the effective tax rate), has fallen steadily, both for gasoline and for diesel, as shown in Table 4-2.

Table 4-2: Costs and Prices of Road Transport Fuels 1975-1994

Year	Gasoline			Diesel		
	Manu-facturers cost	Consumer Price	Effective tax rate	Manu-facturers cost	Consumer price	Effective tax rate
	Won/liter	Won/liter	%	Won/liter	Won/liter	%
1975	45.1	206.6	358	41.8	73.0	75
1980	249.9	680.0	172	160.3	215.0	34
1985	277.9	660.0	137	206.0	277.0	35
1990	173.7	373.0	115	150.7	182.0	21
1991	213.7	477.0	123	150.7	182.0	21
1994	--	564.0	--	--	237.0	--

Source: E. Shon. op.cit. 3rd quarter, 1993.

4.24 Table 4-3 compares Korean fuel prices and taxes with those in several other countries. By international standards two things are notable. First, the Korean tax rates are low, for both gasoline and diesel, in comparison with Western European countries, and more on a par with those of the U.S. and Japan. Second, the ratio of the diesel to the gasoline price is lower than that of any of the other major car owning countries--implying an implicit subsidy for freight vehicles.

Table 4-3: International Comparisons of Fuel Prices

	Korea	Italy	France	U.K.	Germany	Japan	U.S.
Gasoline Price ($/liter)	0.66	1.03	0.96	0.83	0.91	1.16	0.29
Tax Percentage	43	75	79	71	73	49	30
Diesel Price ($/liter)	0.25	0.66	0.54	0.64	0.55	0.69	0.29
Tax Percentage	14	65	61	60	60	36	36
Diesel/Gas Price Ratio	0.38	0.64	0.56	0.77	0.60	0.59	1.0

Source: International Energy Agency, *Energy Prices and Taxes*, Second Quarter 1993.

4.25 The costs of time delays and other nuisances associated with congestion are rising rapidly for both private and public transport.

Table 4-4: Average Traffic Speed in Seoul 1989-1993
(km/hr)

	1989	1990	1991	1992	1993	1992->1993
Car						
Combined	32.60	24.22	21.57	22.62	23.53	+0.91 (+4.02%)
CBD	18.70	16.40	17.66	19.28	19.97	+0.69 (+3.58%)
Outer Areas	37.17	25.78	21.89	22.87	23.79	+0.92 (+4.02%)
Bus	18.60	18.80	18.15	16.88	17.02	+0.14 (+0.83%)

Source: KOTI. Report on Traffic in Seoul. 1993.

4.26 For center city trips by car, parking time can also be substantial. Although public parking charges are below a market clearing rate (for example, in Pusan, private lots charge over two times the rates of regulated public lots), parking spaces are scarce in all large cities. Thus, the shadow price of parking would be much higher for those who do not have access to restricted parking.

4.27 The environmental and other costs of air pollution associated with heavy reliance on internal combustion engines are rising. These costs are borne by commuters and society as a whole, and generally overlooked or undervalued by individual travellers. They are an important component of the costs of urban transport but, for the most part, are not recognized in the "price" users pay for transport. This has important implications for the quantities of travel demanded and the choice of travel mode. These issues are discussed further in this chapter.

4.28 In Seoul and Pusan, the increased use of the subway has already reduced the bus share. Table 4-5 shows recent and forecast modal shares for the six major cities and longer-term trends for Seoul and Pusan. The market share of taxis is high in all cities by international standards. While it is declining in Seoul, it has increased in Pusan from 17% in 1981 to 22.3% 1991, due to the stagnation in bus system capacity.

Table 4-5: Modal Share in Korean Cities: Actuals and Forecasts

		1980	1983	1989	1995	2001
Seoul	Bus		64.3	47.3	38.5	28.0
	Subway		10.0	18.8	30.7	50.0
	Taxi		17.0	15.9	11.1	6.0
	Cars/other		8.7	18.0	19.7	16.0
Pusan	Bus	57.0		50.5	44.1	40.0
	Subway	4.0		6.5	16.7	40.0
	Taxi	17.0		20.3	15.0	5.0
	Cars/other	22.0		22.7	24.2	15.0
Taegu	Bus			55.9	45.5	37.5
	Subway			----	9.0	24.7
	Taxi			17.2	14.2	12.3
	Cars/other			27.1	31.4	25.5
Inchon	Bus			64.1	59.5	42.0
	Subway			7.6	8.6	25.0
	Taxi			13.2	13.1	13.0
	Cars/other			15.1	18.8	2.0
Kwangju	Bus			55.7	54.9	33.3
	Subway			---	---	25.0
	Taxi			24.3	23.9	20.3
	Cars/other			20.0	21.2	21.4
Daejon	Bus			48.2	42.7	26.2
	Subway			---	---	25.0
	Taxi			25.2	26.3	18.3
	Cars/other			26.6	31.0	30.5

Source: Ministry of Transport Statistic and Ministry of Transport, April 1990 (for forecasts). *Transport Improvement Policies*, April 1990 (for forecasts).

4.29 In summary, current pricing practices generally have resulted in urban transport prices rising more slowly than inflation. The net result is both stimulation of additional travel and inefficient allocation of travel among modes, times of the day, routes, etc. However, performance can be improved by introducing new pricing practices.

Current Operations and Regulatory Issues

Bus Regulation

4.30 **Types of service.** There are four types of public bus service in the major cities.

- *Standing buses* (the basic bus service, providing a comprehensive network)
- *Seat buses* (a higher quality, no standing service, also covering a comprehensive network supplied by the same operators as the standing bus)
- *Deluxe buses* (a much more expensive, express service operating on a much more restrictive basis within the city boundaries of Seoul)
- *Village buses* (local services from residential developments to markets and subway stations, using smaller vehicles at a fare below that of the normal service)

4.31 Segmentation of the public transport supply has the advantage of offering a greater range of possibilities to those willing to pay for superior speed or service quality. The progressive introduction of more seat-buses (and very recently the deluxe bus) permits an increase in the average revenue per bus kilometer while retaining a low basic fare for those willing to accept a lower quality ride. In Seoul, the number of seat buses has been rising steadily, and it now accounts for nearly 25% of total bus mileage.

4.32 Entry is regulated in all of these categories. Standing and seat bus routes are allocated by city authorities to selected operators on a monopoly franchise. Although the deluxe bus concept was introduced by the MOCT to meet a perceived need, the City of Seoul regulates the proportion of seat, standing and deluxe buses. Village bus standards are set by the MOCT, but regulation is exercised by the urban districts to conform to Ministry policies.

4.33 **Operator Characteristics.** Services are all privately provided and regulations favor those of minimum size companies. Under an MOCT decree of October, 1993, the minimum size of fleet for licensing is 70 vehicles for Seoul, 40 for Pusan, and 30 for other cities. However, companies have not grown significantly above these minimum amounts, and the average size has been relatively stable over time. Moreover, entry of new companies had been limited. Table 4-6 shows that the average size company in terms of buses is less than 100, and in terms of employees is less than 250 in large municipalities. In the whole country there are only 10 companies with more than 200 vehicles, and only 44 with less than 20 vehicles (predominantly in the smaller cities) with an average of 66 buses and 115 employees per company overall. Seoul has the largest average company size.

4.34 Specific routes are licensed to individual operators and these may be changed with Government approval. There are 423 separate routes in Seoul and 167 in Pusan; and, due to

substantial overlap between companies on various sections, companies must operate efficiently to retain market share. The number of vehicles per route varies according to route length and frequency. In the six large cities, the number of vehicles per route varies between an average of eight in Taejon to about 29 in Inchon, Taegu and Seoul. In the provinces, the average number is lower, indicating a combination of shorter routes and lower frequencies. Except in Seoul and Pusan, routes may be allocated among companies in such a way so as to obtain a "fairer" distribution of profitable and unprofitable activities and to maintain some degree of cross subsidy.

Table 4-6: Urban Bus Company Statistics, 1992

City	Number of Companies	Number of Employees	Employees Per Company	Number of Buses	Average Company Size	Employees Per Bus
Seoul	89	25,413	249	8,734	98	2.91
Pusan	48	7,738	117	2,762	58	2.80
Taegu	32	4,359	118	1,544	48	2.82
Inchon	12	2,890	111	1,166	97	2.50
Kwangju	9	2,643	132	900	100	2.94
Taegon	14	2,267	126	816	58	2.78
Rest of Country	198	53,042		10,440		5.08
TOTAL	402	98,352	115	26,362	66	3.73

Source: *Study on the Improvement of the Bus Fare System,* KOTI. 1993.

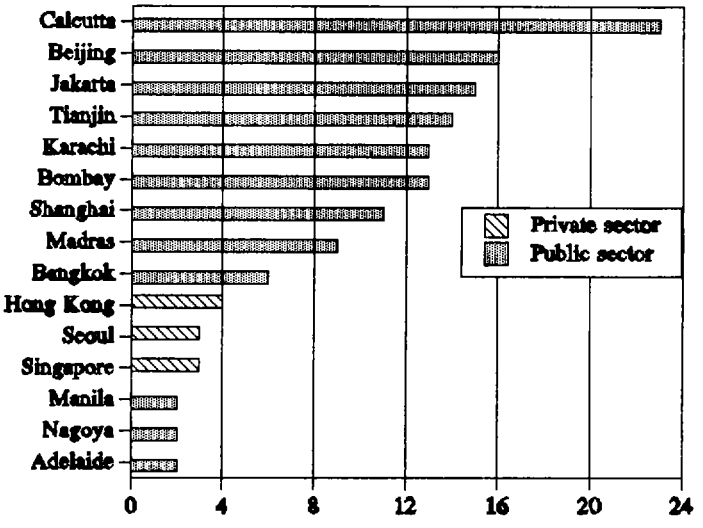
4.35 Bus operators are members of an association which co-ordinates their activities, particularly that of negotiating with MOCT over fares. While it is proposed that responsibility for fare setting should be devolved to the cities, it is unclear how this would affect fare negotiations. A committee also co-ordinates overlapping city and provincial bus services.

4.36 **Operating Efficiency.** The statistics in Table 4-6 also indicate the relative efficiency of labor. The average of 3.73 employees per bus is exceptionally low by international standards (see Figure 4.1), and the average for Seoul is only 2.9 per vehicle. Although labor is 100% unionized, wage negotiations are decentralized to the local level. Labor accounts for only 60% of total costs and administration for slightly over 10%, both of which are low for a company (as opposed to an individual proprietor) organized urban bus sector. There are no direct subsidies for urban bus routes.

4.37 **Bus Fares.** All urban buses charge flat fares, with the same level applying to all major cities. Fares for services were centrally determined by the MOCT with the approval of MFE. At the end of 1993, there was a high base fare differential between categories of service (W250, W550, W1,300 and W200 for standing, seat, deluxe and village bus services, respectively). The fares were reviewed annually following the submission of cost data from the bus operators' associations. Responsibility for fare setting was decentralized to the cities in July, 1994; however, they are unclear about the procedures and criteria to follow. In Seoul, the city is looking to its Development Institute for advice.

4.38 Until the recent substantial fare hike, the controlled real prices had been steadily falling when normalized against the CPI (see Figure 4.2). As this was a period of income growth, the proportion needed to cover bus transport to work (a common indicator of affordability) fell even more rapidly for those using the basic, controlled-fare bus services.

Figure 4-1: Staff Per Bus Ratios in Selected Asian City Bus Companies



Source: **World Bank, *Urban Transport Data Book: 1987.***

4.39 At first sight, this would appear to benefit the use of public transport, and hence would be a positive influence during a period of growing road congestion. However, the real effect is almost certainly more subtle and less beneficial. Increased congestion in both Seoul and Pusan has reduced the number of bus kilometers per bus per day, and hence has increased costs. In Seoul, traffic levels at the city boundary tripled between 1986-93, while those on bridges increased by 50%, and those in the CBD by 30%. Between 1990-93, average bus speeds decreased from 18.8 kph to 17.0 kph.

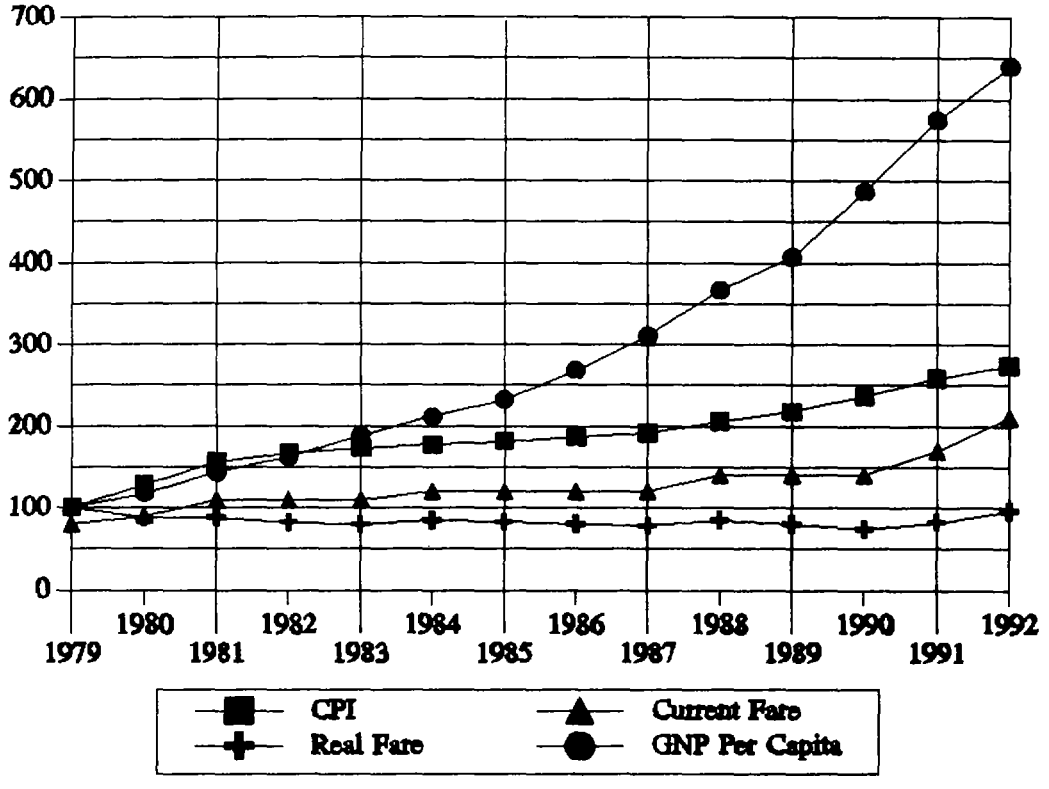
4.40 As private sector bus services are not subsidized and price controls have been quite stringent (with fares increasing less than the rate of inflation of operating costs), higher revenue yields per bus kilometer are required. This can be achieved in three ways. First, operators can attempt to reduce route lengths in order to maintain revenue per bus kilometer, which has occurred to a limited extent. Such a trend not only imposes higher travel costs on those who have to take two services rather than one, but also imposes interchange time penalties. However, since the route shortening ultimately benefitted the subways, the interchange may allow a faster trunk haul which would compensate for the interchange delay. Unfortunately, no evidence exists to establish either the sign nor magnitude of the welfare effect on consumers of the shortened route lengths.

4.41 Second, even with an unchanged network, bus operations can remain financially viable by lowering average frequencies under a controlled fare regime. To some degree, this might have occurred in Seoul, where the opening of the subways reduced the bus market share significantly and average waiting times for buses rose and will continue to militate against bus use. It has been suggested that this is one of the reasons for the high share of taxi trips, both in Seoul and Pusan.

4.42 Third, where companies have some flexibility in the proportion of standing bus and seat buses they operate, they can change their product mix to favor of the more profitable product. This increases the yield per passenger kilometer, and hence the average fare paid, without any increase in the official fares.

4.43 However, the adverse consequences of fare constraints should not be overstated, since vehicle quality has been maintained and operations remain relatively efficient by international standards.

Figure 4-2: Korean Urban Bus Fares 1979-1992



Note: Current fares are in Korean Won; CPI and Real Fares are indexed on 1979 as 100.

4.44 **Bus Patronage.** Urban bus patronage rose from 6 million passengers per day in 1982 to 7.2 million in 1990. It then declined to 6.5 million in 1992, largely due to the increasing share of subway passengers in Seoul and Pusan. Over the whole period, the bus fleet grew steadily from 18,138 in 1982 to 26,362 in 1992; however, the number of boardings per bus fell, primarily as a consequence of declining bus speeds.

Taxi Regulation

4.45 Taxis play an important role in meeting basic transport needs. Fares are cheap, and the ratio of 187 persons per taxi in the six major cities is among the lowest in the world, comparing with 245 per taxi in Tokyo, 413 in New York and 453 in London. Consequently, taxis provide for a high proportion of total trips in the major cities--as much as 25% in Taejon and Kwangju. This compares with less than 5% in Bangkok and the major Japanese cities, between 5%-10% in Bombay, Delhi and Kuala Lumpur, and only 12.5% in such an apparently taxi-centered city as Hong Kong.

4.46 Taxi market shares are expected to decrease where subway services are expanding; increased density of the subway network will undermine the taxi advantage as the fastest public mode between many locations. MOCT's Urban Transport Action Plan of 1993 explicitly recognized this by forecasting both a reduction of the taxi market share and a change in its function from being basic public transport to a luxury mode. However, although taxis are losing their share of the urban transport market, they still hold a comparatively high share by international standards.

4.47 **Types of Service.** Three main types of taxis operate in the major cities--small, regular and deluxe. No small taxis operate in Seoul, while the deluxe model is a relatively recent addition, particularly to Seoul. Although there are some taxi stands (for example, at the airport and railway stations), most are boarded on the street. Within Seoul, a relatively small number respond to telephone calls, for a W1,000 premium charge. A 20% surcharge is levied for trips going outside the municipality of registration; return passengers can only be carried if they are returning to a destination within the municipality.

4.48 Shared riding (more than one paying party carried simultaneously in the vehicle) is illegal, but fairly common. There is no interest on the part of the taxi association to legalize the practice as it is believed that, in Seoul in particular, the subway extension will diminish the demand for taxis.

4.49 **Operator Characteristics.** Taxi services are supplied by either companies or individual owner-drivers. The minimum size company (set by an MOCT decree of October 1993) is 50 vehicles for Seoul and Pusan and 30 for other cities. A minimum of garage space of 13 m^2 per vehicle is required for all operators. The number of taxis has been increasing slowly, and there is a small queue for new licenses.

4.50 Companies require a minimum revenue yield per shift from drivers; anything above this amount is retained by drivers as a supplement to their basic wage. Taxi drivers are unionized; wages were formally negotiated on a regional basis, but are now negotiated locally with each company.

4.51 The 4,000 deluxe taxis in Seoul are exclusively run by owner-drivers. The association of taxi companies declined to enter this business when it was first introduced; they feared the proposal would simply be a mechanism for increasing the drivers' earnings. However, since Seoul appears intent on increasing the number of deluxe (but not regular) taxis, the association now wants to enter this market. As could be expected, the owner-drivers are resisting.

4.52 The MOCT sets entry regulations for all types of taxi service. Drivers must have three years driving experience. Owner-driver license holders must also have been employed over five years in a commercial vehicle company or 10 years in a non-commercial vehicle company, with a good driving record. This effectively ensures that applicants are usually taxi company employees. It is currently MOCT's policy not to increase the number of licenses granted to companies. Vehicle quality checks are made on an annual basis.

4.53 Licenses are tradeable and the 1989 Transport Regulation Study indicated a premium value of W15 million for a company license and W25 million for a private license. The current value of a company taxi license in Seoul was estimated by the operators' association to be about W10 million, and an owner drive license W15 million. These premiums (US$12,500-US$18,000) are low compared to those in most large cities.

4.54 **Operating Efficiency.** Within Seoul and Taegu, taxis drive approximately 400 km a day, three quarters of which is in hire (both figures are relatively high). In Pusan, the distance was even higher (in 1992), at 433 km/day. Although no passenger waiting time surveys exist, the high level of occupancy suggests that delays and unavailability are problems.

4.55 A 1989 study of public transport regulations reported poor driving by taxi operators and a high level of taxi-related accidents, with 30% of taxis per annum involved in road accidents. The proposal, contained in the September 1993 Urban Transport Action Plan, to convert from a distance or time based to a distance and time based taxi fare system, is sensible because it would offer operators an economic incentive to drive more safely. The 1989 study also noted some difficulty in that some taxis refused to pick up passengers travelling to "inconvenient " locations and some illegal operation of vehicles as taxis in the late evenings.

4.56 **Fares.** Taxi fares are regulated nationwide. The present basic rates for the regular taxi are W1,000 for a minimum of 2 km. Given that 75% of the distance driven is revenue earning, this gives an average yield per kilometer of around W375 (Seoul 352, Pusan 371, Taegu 364). For an average revenue earning distance of about 300 kms per day, this yields daily revenues per vehicle of about W100,000. For deluxe taxis, basic fares at the end of 1993 were W3,000 for a minimum of 3 km. Fares are reviewed annually in response to cost data submitted by the operators.

4.57 Taxi companies argue their inability to recruit and retain enough drivers at the wage rates they can afford to pay (the deficiency of drivers in Seoul is reported to be 26.8%) indicates the fares are too low. The relatively low value (by international standards) of the premium on taxi licenses indicates that, for the number of taxis licensed, prices are being held at relatively low levels.

4.58 However, that is not sufficient reason for increasing the fares unless there is free entry into the market. Owner-drivers are only permitted to drive for two days out of three in Seoul, ostensibly for safety reasons. Given that no such restriction is placed on company taxis, the likely effect would simply be to sustain the relative profitability of medium and larger scale companies in a business where economies of scale are notably absent. Higher fares without any increase in the number of taxis licensed would simply increase the profitability of operations at the consumers' expense.

4.59 **Patronage.** As with the bus market, there was a steady long-run increase in taxi use, associated with income growth, followed by a period of decline in Seoul and Pusan, associated with the subways' increased market share.

Metro (Subway) Rail Systems

4.60 Both the Seoul and Pusan subways are being expanded, and a subway is under construction in Taegu. The size of subway networks is summarized in Table 4-7. More are planned for Inchon, Daejon and Kwangju.

4.61 There is little doubt that the subways have had a substantial impact in Seoul and Pusan. In Seoul, the shift from road-based modes to the subway has helped stabilize the level of road congestion in the CBD despite rapidly increasing car ownership. The proposed doubling of the system will increase the range of locations for which subway access will compete favorably with road-based modes, and therefore should continue to help limit congestion. In Pusan, the subway has enabled the economic function of the central city to survive the growth of motorization.

4.62 However, a number of serious, unresolved problems remain concerning the planning, pricing and financing of subways which need careful attention. Urban rail systems are very costly, and hence their economic and financial viability should be carefully evaluated, particularly in smaller cities (Daejon and Kwangju). It is necessary to compare the costs and benefits of rail systems with

Table 4-7: Existing and Planned Subway Networks

City	Subway Network (kms)		
	Existing	In Construction	Proposed
Seoul	120.7	98.5	127.5
Pusan	26.1	6.4	124.0
Taegu	-	21.7	45.1
Inchon	-	-	51.8
Kwangju	-	-	41.9
Daejon	-	-	38.4

Source: KOTI.

alternative investments including light rail and bus systems (although heavy rail systems frequently are justified for the largest and highest-density markets). Also, questions have been raised about how well the metro rail systems are integrated with other aspects of urban planning. This is especially important given the heavy financial burdens associated with subway investments.

C. Developing an Integrated Urban Transport Pricing Strategy

Objectives

4.63 The objectives of pricing policy are the efficient use of resources, environmental protection, equity (welfare distribution) and macroeconomic stability.

4.64 As mentioned earlier, most of the emphasis in Korea has been on stability, with tight price controls imposed on public transport in particular, in the belief this helps restrain inflation.

Pricing Principles for Efficient Use of Resources

4.65 Resources are used efficiently when the marginal benefit to the consumer of a resource devoted to a particular end is equal to the marginal benefit which the resource would generate if devoted to some other use. Assuming that the prices which resources command reflect their value in other uses this reduces to the proposition that efficient use of resources requires that marginal benefit should be equal to marginal social cost. As consumers tend to allocate their income so as to expand the consumption of any item for which the marginal benefit exceeds the cost to them, this implies that, for efficient use of resources, prices should be set equal to marginal social cost.

4.66 If that were the case for transport, then the number of trips taken, their timing, distribution in space, mode of transport and route, would all be optimally chosen. Similarly, there would be longer-term incentives to structure the location and timing of the activities which generate transport demand in a way which efficiently reflects social benefits and costs.

4.67 In practice, there may be constraints to setting prices precisely in this way. These constraints may arise from difficulties in differentiating prices (transaction cost problems), or from conflicts with other objectives (for example, equity or anti-inflationary policies). Where that is so, the "second best" set of efficiency prices or policies would be that which give the nearest approximation to the set of resource uses which would arise from "optimal" pricing consistent with the achievement of the other objectives or the satisfaction of the other constraints. The following sections examine Korean urban transport policy and prices in the light of this underlying philosophy.

4.68 A number of important conclusions follow from this approach

- Efficient decisions on private transport will only occur when all the costs imposed by vehicles are reflected in the charges made directly, and perceived immediately by users (road pricing issues).

- Where prices are not efficient then some effective proxies for them are required; parking policies and physical constraints on car use may be used as proxies but are efficient only when well targeted and implemented (parking issues).

- Commercial operation of public transport services will only lead to efficient choice of mode if the costs of infrastructure use are being paid for appropriately. Otherwise, there may be grounds for subsidizing public transport (public transport pricing issues).

- Regulatory strategies and pricing strategies for the sub-sectors are intimately related (regulatory issues).

- Where there are severe environmental impacts of one or more modes, the correct inducements may require either first best (pollution tax) or second best (countervailing subsidy) price adjustments (environment issues).

- Equity can be addressed through pricing, but serious waste can occur through imprecise targeting of the subsidies (equity issues).

- The macroeconomic considerations must include not only the first order effects on the price of public transport and the consumer prices index, but also subsequent effects (usually the opposite ones) on the general fiscal requirement (macroeconomic issues).

Road Pricing Issues

Principles

4.69 The pricing elements of a strategy to achieve efficient use of resources are congestion charging (to make optimal use of scarce capacity) and full cost recovery from users (to avoid long-term distortions in the quantity of trips made and modal choice).

4.70 The traditional economic prescription has emphasized short-run marginal cost pricing for congested facilities. Peak pricing is already feasible, and rather widely applied for metros, urban

and inter-urban rail, buses, airports and in some cases, air transport. For urban road pricing, the available technologies of manual or electronic cordon charging are only suitable when there are a limited number of arterial roads entering the city that are congested, and can be intercepted by a small number of tolling points. Seoul and Pusan appear to satisfy these conditions. New technologies make sophisticated implementation easier, but are yet to be proven in full scale operation. The experience of Hong Kong also suggests it is likely to prove politically difficult to introduce. The most famous application of road pricing is Singapore (see Box 4.1).

Box 4.1 The Singapore Area Licensing Scheme, 1975 to Present
Background Information

The Singapore Area Licensing Scheme (ALS) which began in June 1975 is the world's foremost example of road pricing. During the morning peak period of 7:30 to 9:30 a.m. (except Sundays and holidays), automobile drivers desiring to enter the restricted zone -- an area of over 5 square kilometers --within the central business district of Singapore were required to purchase a daily or monthly license from the kiosks or post offices just outside the restricted zone.* Initially, taxis, buses, carpools (of more than four passengers) and commercial vehicles were exempt from the entry fee. The specially-shaped and color-coded licenses were priced by trial and error at around S$3 [US$1.25] each, with the day or month printed in large characters and displayed near the top left hand corner of the windshield. The visibility of the dated color stickers allowed traffic wardens to check them as vehicles drove by any of the gantry posts signaling the entrance to the zone at the city speed limit of 50 kph. It is the nonstop feature of the ALS-- as distinct from manually operated toll booths which also attempt to implement cordon pricing -- that is unique and reaps significant savings in travel time. The ALS is part of a comprehensive package of traffic restraints by the Singapore Government. Several months prior to the opening of the ALS on June 2, 1975, authorities instituted the following complementary traffic management measures in order to achieve the goal of 25% to 30% reduction in traffic volume: a) monthly parking charges in both public and private parking lots were about doubled (via mandated price increases and surcharges) and uniform hourly rates were replaced by rates which varied by geographical location and duration of stay; b) 15 park-and-ride facilities (providing about 10,000 new parking spaces) were constructed just outside the restricted zone to ease the switch from private to public transport; c) premium franchised shuttle bus services were provided to facilitate the transfer from the fringe parking lots to the downtown area; and d) flextime was encouraged by the government as part of a wider public information campaign. After 1975, there were a couple of changes in fees, boundaries and operating hours (see Ang, 1989, Table 2). Principally, the exemption of taxis from ALS fees was rescinded (August 1, 1975) and company cars were required to pay twice the rate of private cars (January 1, 1976).

Beginning June 1, 1989, there was a new and major revision of the ALS: a) the restricted times of operation were extended to cover both the morning and afternoon peak periods, with the latter in effect from 4:30-7:00 p.m. (but later changed to 4:30-6:30 p.m.); b) *all* vehicles were charged, with the exception of emergency vehicles (such as ambulances, police cars and fire engines) and public buses, so that carpools were no longer exempt; c) the daily license fee for automobiles was lowered from S$5 per day to S$3 per peak period entry -- a (more than) 40% decrease in real charges; and d) motorcycles were to pay one Singapore dollar per day (after July 1, 1989).

* The restricted zone has now been increased (by land reclamation) to 725 hectares (or 7.25 square kilometers). The monthly license fee is set at 20 times the daily license fee.

Source: Hau, T.D., *Congestion Charging Mechanisms for Roads*, The World Bank, WP 1071.

4.71 Based on a longer-term view of marginal cost, the optimal user charge should cover capital costs and the total expenditure on road maintenance (this assumes that roads exhibit constant returns to scale in use and that capacity can be smoothly adjusted to demand). Above all, sophisticated structuring of charges to reflect long-run marginal cost would be technologically just as difficult as short-run marginal cost pricing.

4.72 The crux of the question here is congestion. During congested periods, traffic volumes are such that, as traffic increases, average speed decreases, and average cost per vehicle or passenger mile increases. The cost perceived by the marginal road users, their own private cost, does not take into account the extent to which they slow down all other road users. The true marginal social cost exceeds the currently perceived private cost or price (for details see Hau, 1992(a)).

Congestion Pricing

4.73 Traffic studies of Seoul show that traffic volumes and speeds have stabilized in the CBD at high congestion levels, with mid-day speeds below those at morning and evening peaks. Outside the center, traffic volume continues to grow, speeds decline, and the difference between speeds in peak and off peak periods narrows--however, congestion is not yet a problem on the whole system throughout the day.

4.74 This indicates that a case can be made for differential pricing, with higher prices charged for the CBD and congested expressways and for the peak hours. Parking supply and charge policies can be an effective instrument to reduce congestion within an area if accompanied with other strategic demand management measures including carpool and transit use incentives, park-ride options in other locations, and expansion of transit services. Parking policy should aim at limiting the total amount of parking space in key locations such as the CBD and increasing the costs of parking substantially.

4.75 The argument for imposing higher costs on the use of congested urban road space is that current users are not paying a price that matches the costs they impose on society, and thus use urban road space in a manner that is economically excessive.

4.76 The direct effect of excessive traffic volume is increased congestion, reduced travel speed and associated environmental impacts. Thus, a case can be made for congestion charging based both to achieve optimum speeds and flows and the "polluter should pay" principle.

4.77 The absence of appropriate congestion charges also has a significant indirect effect on public transport: As charges for private road vehicles are low, this discourages the use of public transport. Public transport revenues are lower than they would be with optimal road charges both because buses and subways carry lower volumes than they would otherwise and because the relatively low road charges require corresponding low public transport fares. In fact, this could lead to subsidies for the public transport, with adverse fiscal impacts on the municipalities (as in the case of the publicly owned metro undertakings).

4.78 Even where public transport is efficiently supplied by unsubsidized private sector operations (as with the bus sector), passengers are penalized twice: First, higher levels of congestion slow down bus services (though this can be attenuated to a large degree by well designed bus priority

systems). Second, with relatively low fares, the system requires either higher levels of utilization and lower service frequency or network density in order to break even. Thus, the existence of an operationally efficient bus service is beneficial, but is no proof that all is well in urban transport policy.

4.79 The thrust of this argument is that there is an interaction between private and public transport in urban areas such that undercharging for the use of private transport adversely affects the finances and quality of service. The optimal system would be one in which the total time, money and inconvenience costs of personal transport were minimized.

4.80 Increasing the charges for the use of scarce urban road space would thus have three effects.

(a) It would make the use of a scarce resource (road space) more efficient;

(b) It would generate extra traffic and revenue for the public transport operator;

(c) It would generate tax revenues for the municipality.

4.81 The significance of this for Korean transport policy is that by increasing the charges for the use of congested urban road space, authorities could reconcile the growing demand for infrastructure with the limited public financing capability, while at the same time increase the efficiency of current capacity. Such a move would eliminate the need to provide more transport infrastructure, both for public and private transport, which is beyond current public sector financing capability.

4.82 An ideal scheme would charge a price for the use of urban road space equal to the difference between the amount of money effectively being paid for the use of road space (the marginal fuel tax cost per vehicle kilometer) and the marginal social cost per vehicle kilometer (the increase in cost imposed on all other road users, both in time and operating costs resulting from one extra vehicle being on the road). This would be related to congestion level, and hence would vary both by location and time of day. Such a scheme would be very complex, and most of those considered have been somewhat simpler.

4.83 Simpler schemes can be applied with uncomplicated technology and manual enforcement, using either the period a vehicle operates within the charging area, or the entry of a vehicle into the congested area during the charging period as the proxy for the contribution a vehicle makes to congestion.[1]

4.84 A time based charging scheme requires that drivers of vehicles operating within a congested area must pay a special fee for that privilege, such as Singapore's area licensing scheme (ALS): Vehicles must carry a special daily license if they wish to operate within the CBD during peak hours (originally only applied to vehicles crossing a cordon into the inner area in the morning peak on the assumption that the evening peak would be the mirror image of the morning peak involving the same vehicles and imposing the same costs). Although drivers paid for one day within the congested area, in practice this was primarily enforced as a cordon pricing scheme, in which vehicles carry the vignette as a proof of payment at the cordon crossing points.

[1] See Hau 1992(b).

4.85 A point pricing scheme involves charging vehicles for crossing particular cordons or screen lines selected to capture the traffic which is making the major contribution to congestion. The pricing points in such a toll scheme could be a cordon--as is now applied in Bergen and Oslo--or more numerous and widespread, as was the case with the experimental scheme in Hong Kong.

4.86 More sophisticated technologies are now being developed to implement congestion charges. This involves "smart cards" which can automatically levy charges for the occupation of congested road space. The use of this technology allows revenue to be collected in advance; also, it avoids the infringement of privacy as in the Hong Kong scheme, where vehicle location and use had to be recorded. In addition, the cards can be used for public transport or parking, as well as for use of the car.

The Possibility of Cordon Pricing in Korean Cities

4.87 Some consideration has been given to the use of road pricing in the form of increasing the tolls on the tunnels in Seoul from the present W100 charge to a W1,000 charge, together with an exempt HOV lane. While studies have suggested the price elasticity of demand may be significantly greater than zero (perhaps as high as 0.2), this will have very little overall effect for three reasons:

(a) Diversion of traffic to other routes which are longer and more sensitive to congestion may mean that, even with a reduced number of trips, the total amount of vehicle movement will be little reduced and the total delay in the system might even increase;

(b) Evidence of current speeds within the tunnel suggest that delay is occurring not because of overload inside the tunnel, but on the intersections outside; diversion of traffic to routes which reconverge on these bottlenecks will leave them little improved;

(c) Tunnels constitute such a small proportion of the total urban network that, even if tunnel traffic were reduced, volumes would not be much affected.

4.88 While the increased use of pricing to discourage traffic is desirable in Seoul (and Pusan), a much more strategic approach is required. Given the day-long congestion in the CBD, and the increasing levels of congestion outside it, point pricing on the tunnels is almost irrelevant. Instead, authorities should consider either cordon pricing, which could be introduced at different interchanges of the inner and outer ring roads and/or to differential licensing or fuel charges to discourage car use. While many Koreans aspire to own a family car, decisions on ownership and use should be made on the basis of the full social costs.

4.89 **Congestion Charge Revenues.** In 1985, KHRIS conducted a study of congestion charges for the Seoul CBD, which examined (a) an area licensing scheme only for cars, (b) a scheme for cars and surcharges on taxis and (c) charges on all road users. The conclusions were that, for 1986, a charge of W1,000 on each vehicle crossing into the CBD during the peak period would yield a gross benefit of W62 billion per annum, and a revenue of nearly W11 billion. For the off-peak period, the maximum benefit (savings in time and vehicle operating costs) was obtained with a lower charge of W500 per vehicle. These charges would reduce the flow of cars and taxis at the cordon by 45% at the peak, and by 66% and 55% respectively during off peak. The total revenue obtained

from an application of charges approximating the welfare optimum, applied both at peak and off-peak, would be about W20 billion per annum. All values were expressed in 1983 prices.

4.90 Although it was not possible in this present review to rework the model, it is possible to determine the amounts anticipated if the same model were applied to current conditions (see Table 4-8 and detail in Annex 1).

Table 4-8: Updated Study of Cordon-Based Road Pricing for Seoul
(1994 Won)

	Peak	Off peak	Total
1985			
Volume (vehicle/hour)	61,740	30,237	
Regional ave speed (kph)	19.44	29.28	
CBD ave speed (kph)	14.10	22.15	
Price (won)	1,000	500	
Multipliers			
CPI (1983-1993)	1.66	1.66	
CBD Traffic (1986-1993)	1.00	1.41	
Price (1986-1993)	1.00	2.00	
Factor for price change		0.78	
Revenues (million won)	16,549	39,781	656,330

4.91 In total, the factoring of cordon charges for the CBD (in the 1985 study), and the use of a charge at half that level for traffic entering the city, suggest an annual revenue of nearly W140 billion with charges still below the economic optimum.

4.92 **Cordon Charge Revenues - A Different Approach.** An even simpler method might be to use recent hourly counts of cordon crossings to determine the heaviest traffic period for charging , and then make conservative assumptions about the amount of traffic that would be reduced or diverted if cordon tolls were introduced. If it is assumed that charges were levied on inbound vehicles only between 07:00 and 20:00, then no more than about 25% of the CBD cordon traffic and 30% of the boundary cordon traffic will be missed. The estimate assumes that 10% of the vehicles at the CBD cordon and 40% at the external cordon are buses or freight vehicles that would be exempt from charges. It also assumes that annual traffic is 320 times the calculated daily averages (to allow for holidays, bad weather, etc.). This calculation used the same diversion factors for the central cordon (where detours for through traffic are more possible) as those in the KHRIS study. For the external cordon, a lower diversion of 20% was used. On this basis, the estimated revenues are shown below for all day tolls at different levels.

Table 4-9: Estimated Cordon Charges

Cordon	Tolls (won per trip)	Diversion (%)	Revenue (billion won per annum)
CBD	1,666	30	142
Boundary	833	10	92
TOTAL			234

4.93 It must be emphasized that these are extremely crude but conservative estimates of the revenue generated by a simple charging scheme and further calculations are recommended. Nevertheless, based on this estimate, higher tolls might be appropriate. An estimate of W250 billion per annum as the yield of a simple cordon pricing scheme for Seoul appears reasonable. A similar scheme for Pusan might, on the basis of city size and traffic flows, yield up to W100 billion a year.

Traffic Management and Parking Policy Issues

Traffic Management

4.94 Transportation system management (TSM) strategies are commonly used in large cities. Seoul, Pusan and Taegu are equipped with area traffic control systems. Also, the bus priority concept is new, but gradually expanding. Although there have been some interesting individual experiments, (such as that of Samsung with staggered work hours and the development of bus priority schemes), there has been little attempt to develop a comprehensive, integrated, strategy of travel demand management (including auto restricted zones, parking pricing and supply, carpooling, etc.) or to make wider use of TSM in a strategic context (including not only bus lanes but HOV lanes, other bus priorities, vehicle restriction by time and location, etc.).

4.95 In Seoul, the major considerations appear to be speed and safety, to be achieved primarily by managing traffic signals and enforcing controls. A system of with-flow bus lanes has been introduced, although these appear to have been designed in isolation from the TSM strategy. Point improvements, such as ramp metering on entrances to the Olympic Expressway, are also being considered. Most of the TSM emphasis appears to be on junction design and traffic signal timing (which is controlled by the police).

4.96 There is a "10th day holiday" system for car use in all large cities, whereby every vehicle is to be kept off the road for one weekday out of ten. However, effective enforcement is limited to Government vehicles. In any case, evidence from other cities suggests that as car ownership levels rise, such a car-based constraint is ineffective.

4.97 Thus, this report strongly recommends a comprehensive urban traffic strategy be developed further. This does not conflict with the earlier recommendation to introduce new road pricing systems, as many of the elements of a strategy (car pooling, HOV lanes, etc.) are more effective when underpinned by an appropriate pricing structure.

Parking Policies

4.98 Parking policy is the municipalities' responsibility. Public offices provide free parking for visitors, even in city centers and businesses have considerable freedom to provide parking both for operational and public use. Some mild economic incentives are being proposed to encourage businesses to limit parking provision. For example, authorities intend to partly rebate a tax on businesses for traffic they generate (which yielded W140 billion in 1993), if employers introduce measures to limit employee parking. But these incentives are small compared to other influences on parking.

4.99 Much of the existing public parking stock was built from general funds; and, it appears that even in financial terms, parking has an effective subsidy given the high cost of land. Although W20 billion are allocated to each of the Seoul districts for parking purposes, and fines for illegal parking are used to finance the parking stock, this is not enough for major land purchase. Thus, SDI is encouraging the districts to control on-street parking.

4.100 Although *ad hoc* policies deal with specific parking issues, there does not appear to be a strategic view of the role of parking in urban management policy. Moreover, as public parking space constitutes only part of the total stock, parking policy is a very weak instrument for strategic traffic control unless policies are extended to private parking as well.

4.101 The basis for incorporating parking strategy within an integrated urban management policy is that the number, location and timing and modal composition of trips should reflect the private cost incurred by tripmakers everywhere, and their marginal social costs (including environmental and congestion externalities). First, where prices for the use of road space do not reflect the full opportunity cost, parking policies may sensibly be used as a proxy. As first "best policy," this usually means constraining the total availability, or controlling the charges for parking in central areas, or in areas of high congestion. Second best policies, devised to counteract other distortions, may involve subsidies for such parking which reduce the amount of congested or environmentally damaging vehicle use in certain areas. For instance, parking might be provided below cost at metro stations in outer areas to encourage substitution of metro for car use.

4.102 Second, no justification exists for subsidized public parking in the most congested central locations. Hence, CBD public parking charges should always be set at least at the same level as the full commercial rate for publicly available but privately provided parking. Where such parking is presently provided, there is a strong argument either for selling the space at its full market value to a private parking supplier or developer, or for licensing the management of parking at a fee to private operators. Both approaches would benefit traffic in the short term and improve the financial capability of public authorities to finance the necessary transport capacity in the longer-term.

4.103 Third, the strategy should also recognize the implications of parking availability on trip making and social costs. Hence there is a case for taxing privately provided central parking space in very congested locations.

4.104 Finally, it follows that parking policy needs to be location-specific. A strategy of subsidized public parking might be sensible in association with park-and-ride arrangements in major cities when there is adequate public transport capacity, but is not where the subsidy will generate

extra road traffic. The essential requirement is that the strategy be consistent with the rest of the relevant urban transport management package--which will require increased planning and management capability at the local levels and a review of current parking policies.

4.105 In Seoul, many vehicles use on-street parking (often illegally) on narrow side streets which reduces capacity and impedes traffic. Recent studies indicate that parking supply is 72% of demand. Employee parking is mostly provided free by employers, though only about 20% get this free in the CBD. South of the Han River, employees have relatively few problems.

4.106 CBD parking in Seoul is already relatively expensive by international standards, although a strong case can be made for raising prices even further. Public parking prices are set by the city government and they vary by location. For example, the maximum price for public parking is W1,200 per half hour for short-term parking and the rates per hour double for parking above two hours. Private sector parking charges are not controlled, and the highest prices are W1,500-W2,000 per half hour. Rates double for long-term parking, as in public spaces.

4.107 In suburban Seoul, parking space is reserved in residential areas for residential permit holders. Parking space in suburban business areas is to be expanded, mainly at metro stations. The current price is W300 per half hour for short-term parking, and W30,000 per month for park-and-ride monthly parking permits. However, no attempt is being made to ensure the outer area parking is used primarily for park-and-ride purposes. The technical possibilities of enforcing park-ride use should be examined. Suburban stations must encourage park-and-ride, given that congestion is moving outward.

4.108 In Pusan, the shortage of parking is much more acute than in Seoul, as current supply is estimated to be only 35%-40% of total demand. Public parking represents about 1/3 of the total supply, and over 30% of this (3,000 spaces) is in congested areas of the CBD. Given the acute shortage with very limited potential for increasing supply (land value, density, topography and limited land), there is no rationale to maintain low public parking rates compared to private charges. On the contrary, increased public parking charges could generate substantial revenue and inhibit car use.

4.109 The fundamental reason for the parking problem in Pusan is the low charge (which is regulated). Private rates are over two times higher, depending on the location and duration of parking. If public rates were closer to private ones, the distortion in parking demand/supply might change. Moreover, Government incentives to private parking suppliers, including an excess land tax and various tax exemptions (such as sales, urban planning and property taxes), also affect the price of private parking and permit low-cost auto travel. Since public parking rates have low ceilings and land costs are high, the private sector--even with incentives--finds investing in parking is not profitable. Thus, the city should determine parking rates by considering the true cost of providing a space (opportunity cost of land is often overlooked), competitive rates offered by the private sector, and any other policy objective (such as discouraging the use of private cars). However, such a market-driven pricing policy can only be initiated after the gap between public and private rates is closed, hidden subsidies to the private sector (such as tax exemptions) are removed, and the full cost of public parking is charged. Currently, Pusan is considering raising public parking rates for the congested part of the CBD from US$7.50 to US$12.50 a day, and for short-term on-street parking, from US$1.60 to US$3.75. These initiatives are a move in the right direction.

4.110 Pusan's parking policy will also restrict the construction of spaces in the CBD and encourage it in suburbs. Future investments in this area are to be concentrated in the suburbs, particularly near subway stations. The basis for charging low parking fees to park-and-ride passengers would be to encourage subway use from outer areas. A comprehensive parking supply and pricing policy is essential for all large Korean cities.

Public Transport Pricing and Regulatory Issues

4.111 The objective of an integrated urban transport strategy should be to ensure that public transport is organized and managed in a manner that it is the cheapest form in real terms (accounting for direct money costs, congestion and environmental externalities) and that the most appropriate mix of public transport modes is provided. In the absence of an efficient set of prices for road use by cars, the question arises as to how public transport strategy should best be formulated to compensate for that. In particular, that raises questions about general public transport subsidies, public transport price controls within an unsubsidized regime, and the regulation of entry into the various public transport modes.

Public Transport Subsidies

4.112 Undoubtedly, given the level of congestion in major cities, the marginal social cost of the private car trip is very high, certainly at peak times. A policy of subsidizing public transport might be considered a "second best" alternative for efficient congestion prices. However, in practice, there are various reasons why it might not be effective.

4.113 First, with regard to *bus cost structures,* it is not necessarily the case that the marginal costs of public transport at the peak are less than those of the car. Within a typical bus operation, over 90% of costs vary with respect to either the number of vehicles employed or the number of bus kilometers run. Even the administrative costs vary directly with the size of the operations. Consequently, there are no significant economies of scale in bus operations and in that sense, average and marginal costs are constant. But operating speeds for buses are also adversely affected by congestion, so the costs for peak vehicle miles are higher than the average; and, the level of capacity provided will also be determined mostly by peak demand, so some capacity costs (such as the number of buses) would not be incurred if that demand were lower.

4.114 Second, a similar argument may apply to *rail cost structures*. Recognizing that only 50%-60% of costs are directly related to the amount of capacity provided in the short run, and the basic infrastructure are indivisible it is unclear if scale economies in rail are significant in the short-run. In cities like Pusan and Seoul, new rail provision is likely to be fully utilized very rapidly, particularly at the peak, so it is the long-run marginal costs (including the incremental capacity costs) which are relevant to the issue. If these are nearer to the marginal social costs of the car, then something more like full cost coverage would be appropriate. The peak period pricing for urban rail and bus becomes relevant considering that the peak load determines capacity requirements, and hence the appropriateness of loading the capacity costs on peak users.

4.115 Third, the *structure of elasticities* must be considered. Where the basic purpose of the subsidy is to divert traffic from the private auto to public transport, the ideal situation would involve a very high cross elasticity of demand for auto use with respect to public transport pricing. Empirical evidence (albeit mostly from developed countries) suggests that this cross elasticity is very

low (perhaps 0.1) in the short run. While it may be somewhat higher in the long run, due to effects on car ownership, it would still appear to be a relatively weak instrument. Thus, a subsidy to public transport might not serve to reduce congestion.

4.116 Fourth, there is the question of impacts on *efficiency*. While the evidence of bus operating efficiency in Korea presented earlier suggests that public transport is supplied relatively efficiently compared to other countries, this is within a system in which there are inducements to operators to minimize costs in order to increase their profit. The introduction of subsidies would change the current set of inducements. The magnitude of this effect is difficult to predict, but it would be desirable to avoid general subsidy arrangements.

4.117 Finally, *fiscal capacity* must be considered. One of the most serious problems for public transport operators is generating enough cash flow to maintain vehicles and infrastructure, and hence sustain the service. An enterprise unable to maintain its assets in operation is clearly unable to contribute properly to the allocation and distribution objectives discussed previously.

4.118 In economic terms, as the capital costs of infrastructure are sunk, it is common to view the revenue requirement as that of securing enough, from whatever sources, to cover the costs of operations, maintenance and replacement of assets. Two immediate problems arise, however, in interpreting that definition. First, the implications for the level of cost recovery from the farebox depends on other sources of secure revenue. For example, RATP in Paris is financed in part from a payroll tax on employers, dedicated for public transport support. In Japan, developers have been extensively involved in mass transit development (see Box 4.2) as a viable commercial initiative. Even where they do not initiate it themselves, they are expected to contribute to the provision of mass public transport in new towns (see Box 4.3). Second, covering full operating costs as defined above may be sufficient to maintain the system at its current size, but gives no inducement for investing in system extensions and development, especially if the private sector will have to provide funding.

Box 4.2: Mass Transit and Land Development in Japan

The Tokyu Corporation, which is one of the leading urban rail companies in Japan, has undertaken an interesting integrated urban rail and land development project consisting of 20.1 kilometers of mass transit and more than 3,000 hectares of land development.

The area was formerly a vast and hilly area, scarcely inhabited and underdeveloped. It has become a community of 440,000 people, centered around the mass transit system and feeder bus network.

Like most major private rail lines in Japan, the rail construction and operation costs have been wholly covered by the farebox from users. Although, in this current financial situation and under the existing government regulation on rail fares, development gains do not need to be, and cannot be, earmarked to recover the costs of rail construction and operations, the development gains have accrued to the Tokyu Corporation group which is the parent company of the Tokyu mass transit company.

Source: *Private Financing of Urban Transport Infrastructure in Asia*, Shunso Tsukada and Roger Allport, ASTIN,

4.119 In the Korean context, with high levels of congestion and urban traffic growth, the problem appears to be that of finding ways to finance expansions without crippling municipal

finances. Therefore securing adequate funds to sustain the system has to be seen as either raising private capital which can be serviced entirely from incremental farebox revenues, or generating sufficient surpluses from current operations to contribute to capital requirements. The compulsory contribution of car purchasers to the financing of public transport (they must buy subway bonds of 5-year maturity) is a useful way of ensuring this finance. However, the use of short-term bonds to finance long gestation and long-life investments creates such difficult refinancing problems that a move to more secure longer-term financing is important for short-term operational as well as long-term financial security (detail in Chapter VI).

Box 4.3: Cost Sharing Guidelines for Mass Transit Links to New Towns in Japan

(a) The developer pays to the operator half of the construction costs of ground-level urban rail infrastructure;

(b) Within the new town area, the developer sells the land for the urban rail system to the operator at a market price which reflects its undeveloped value;

(c) Outside the new town area, the developer pays the operator the difference in price for land at its historic undeveloped value and its actual value (which will have risen due to the proximity of the new town development); and

(d) On the basis of the above contributions by the developer, central and local governments will each provide grant funding up to 18% of the construction cost of the urban rail system.

Source: *Private Financing of Urban Transport Infrastructure in Asia, Technical Note Series for Urban Transport in Asia: An Operational Strategy for the 1990s* (draft), ASTIN, March 1991.

Control Over Public Transport Fares

4.120 Some believe that price controls without subsidies is an alternative strategy to secure similar objectives. Because *urban bus* service is provided by the private sector without subsidies, there are no fiscal implications of fare regulation. However, the regulation of bus fares, particularly on a national basis, has some efficiency effects which may spill over to other modes. In particular, as only services which can cover their costs in total will be provided, fares set too low have the effect of reducing service below levels which might be commercially sustainable.

4.121 Given the widespread evidence that demand for public transport is more elastic with respect to level of service--particularly density and frequency--policies aimed at securing high levels of service quality may well be more effective than those directed at prices. Hence, the traditional Korean policy of maintaining low public transport fares may have accentuated rather than helped the urban transport balance by creating fiscal pressure on bus operators to maintain a level of service which would not attract traffic from the private car or the taxi.

4.122 Taxi fares are also regulated. Where entry is free and there are sufficient independent operators to ensure competition, such regulations have two effects. First, they determine the number of operators who can make a living in the market, and hence the capacity/demand balance. This, in turn, determines the waiting time and quality of service. Second, they also determine the quality of vehicle which can be operated with given supply capacity and demand levels.

4.123 In conclusion, control over fares in an unsubsidized commercial public transport sector will normally have the effect of reducing service levels. This will aggravate any tendency for

private transport to expand at the expense of public transport. Therefore, bus fare control is generally not a viable strategy to counteract the lack of efficient prices for car use.

Public Transport Regulations

4.124 The history and particular conditions with respect to transport fare controls leave three important questions unresolved.

(a) How to avoid distortions between private and public transport market shares?

(b) How to reconcile the conflict between equity and inflation- control objectives and efficiency (which has been hampered by controlled fares)?

(c) How to obtain a proper balance between the modes of public transport?

4.125 *Distortion of market shares* could be minimized by allowing public transport to meet users' needs through several grades of service, with different fares/waiting times vehicles which expand the range of consumer choices. This has already been approached by adjusting the "basic" (standing bus) and "superior" (seat-bus and deluxe) capacity. If that were linked to complete freedom of pricing for at least the superior category, then public transport would be released from the current constraint on its ability to attract passengers from private cars. This does not perfectly compensate for underpricing the private car, and should be accompanied by priority for public transport on the road. For example, a greater use of high occupancy vehicle lanes, particularly around the CBD and other dense zones, would complement increased freedom for public transport without any direct fiscal consequences.

4.126 *Reconciliation of equity and efficiency objectives* can also be approached through quality differentiation of public transport. While continuing to control fares for basic service will ensure the availability of some low price public transport, its frequency or network density will be progressively reduced, unless the revenues are sufficient to maintain that basic level service. Thus, a general strategy of liberalizing entry should be encouraged to provide superior service (at higher prices) with the control of basic fares still in place. More examination and experimentation with the effects of different fares on the level of capacity offered within different service grades, and hence on waiting times, is necessary to further develop this strategy.

4.127 *The imbalance between public transport modes* is mainly a problem of the relative role of, and co-ordination between, rail and road based operations. In particular, in the absence of any financial or ownership link between the subway and buses in the major cities, the latter might continue to supply service on congested major trunk links at the same time as a less congesting rail alternative is available. In the worst congested situations, for example in Pusan, road congestion may itself be sufficient to persuade bus operators of the wisdom of restructuring their routes to provide better facilities for mixed (bus/rail) mode journeys. Village buses already facilitate that to some extent. An appropriate regulatory strategy might be to allow free entry to new routes serving rail if existing operators do not provide adequate service to them. Again, as it is not possible for this report to suggest the detail of implementation, further investigation is recommended.

Decentralization of Public Transport Fares

4.128 At present, bus and subway services in the major cities are developed, planned and operated quite independently. No multi-modal public transport fare scheme presently exists. And, given the large number of bus companies, co-ordination is very difficult, particularly in the area of revenue sharing between bus operators and metro.

4.129 The Government initiative to decentralize control over bus fares is welcomed as part of a more general decentralization. However, the policy needs to be supplemented in two areas, to create a proper institutional basis for integrated urban transport planning. First, urban rail, bus and taxi fares should all be part of a composite strategy. If subway fares remain centrally determined, this will keep cities from developing an integrated strategy. Second, a similar link exists between fares and service levels. If entry control remains centralized, while fares are locally determined, this may significantly impede the development of an integrated urban public transport strategy.

4.130 The combination of congestion and increasing subway coverage in Seoul and Pusan may create some incentive to bus operators to restructure routes to serve railheads. Flat fare structures also encourage bus operators to do this in order to maintain their revenues per bus hour by shortening routes in the face of congestion. Relatively flat subway fare structures also have the effect of encouraging longer trips or larger proportions of longer trips to be undertaken by subway. An optimum combination of public transport modes would only arise accidently from such an unintegrated fare structure, and, perhaps even worse, the payment of double fares when making a bus-metro or bus-bus trip militates against public transport and in favor of the car (especially where employee parking is free).

4.131 The implication of this is that possibilities of integrated charging should be pursued. Simple mechanical systems in which the bus operators accept and eventually trade in, coupons issued by the subways, and vice versa, are not too difficult to design in principle, although they introduce some extra administrative costs. More sophisticated electronic systems require all buses as well as the subway system to be equipped and may be more difficult to implement. This highlights the need, mentioned previously, to enhance the municipal capability to analyze, plan and implement integrated urban transport strategies.

Environment

4.132 The growth of traffic constitutes the major adverse impact on the urban environment. Increases in the general cost of motoring may reduce that growth rate but is not likely to be the major element in efforts to reduce environmental impact. Instead, a more effective strategy will need to encourage the selection of cleaner fuels and vehicles.

4.133 The main issue of fuel pricing is the very large differential between the price of diesel and gasoline, which induces a higher proportion of diesel cars. It does not appear to be a major problem in Korea since domestic cars are mostly gas driven. The fuel consumption advantage of diesel engines reduces CO_2, which is directly proportional to fuel consumption. But the advantages of diesel engines regarding CO, NO_x and HC emissions are substantially eroded by the diffusion of three way catalytic converters which are now incorporated in all new vehicles sold on the Korean market. Moreover, poorly adjusted diesel engines are a source of black smoke and fine particulate. The conclusion is that a tax differential in favor of diesel cannot be justified on the basis of its

comparative environmental advantage. Consideration should therefore be given to further reducing or eliminating this differential. Moreover, fuel pricing should be treated as an instrument for encouraging the use of environmentally friendly alternate fuels (e.g. CNG, LPG, petrol/ethanol blend, methanol, etc.). Similarly, appropriate auto emission standards can influence the quality of vehicles.

Equity

4.134 It has been shown earlier that the real costs of both public and private transport have been falling in Korea in recent years. At the same time, real earnings have been increasing so that the proportion required for a basic work journey has fallen consistently over the last decade and a half. Ability to afford basic transport requirements has therefore increased.

4.135 In practice, for many public transport users, shifting from standing bus to seat-bus or taxi in order to save time has undermined this price advantage. But it remains the case that for those who wish to travel cheaply, considerable improvement has occurred. The availability of several different modes of public transport offering different price/speed/comfort combinations - especially where the basic service is available appears to be a more than adequate protection of the poor. Increases in the cost of motoring (either through fuel taxes or the introduction of congestion charges), or in the cost of deluxe public transport is thus unlikely to cause inequities.

V. PRICING AND USER CHARGE POLICIES IN INTER-URBAN TRANSPORT MARKETS

5.1 This chapter examines pricing practices in order to:

(a) Determine if they help or hinder efficient utilization and resource allocation;

(b) Identify the potential role for pricing policies as a way to ration or manage the escalating transport demand;

(c) Determine if revenue generation can help finance transport investments, whether directly by Government agencies or by private sector participation (see Chapter VI).

A. Pricing Policies in Land Transport

Inter-Urban Rail

5.2 The Korean rail service is a Government operation under the KNR within the MOCT that offers a wide range of service for both freight and passengers. In 1992, rail accounted for 3.5% of freight tonnage and 15.8% of ton-km (see Chapter II). This contrasts to the commercial trucking sector's shares of 15.8% and 12.6% for tons and ton-km, respectively.

5.3 The rail share of passenger traffic shows a somewhat different pattern (Chapter II). In 1992, rail accounted for 2.9% and 19% of passengers and passenger-km respectively, in contrast to the highway sector that accounted for 91% and 71%, respectively. It should be added that road transport fares are generally lower than those of rail, with the possible exception of third and fourth class fares that are more competitive and subsidized by the Government.

5.4 **Korean National Railroad.** In general, KNR's objective is to set freight tariffs and passenger fares at profitable levels that fully cover costs. However, because of Government-imposed constraints, including the need to obtain MOCT and MFE approval for price increases, the railroad has not always been able to achieve this objective--especially with third and fourth class passenger fares. Though disaggregated cost data by service type are not available, there may be cross-subsidies between the fares on the Saemaul trains (a higher price and limited-stop service along trunk routes) and the branch services.

5.5 Government subsidies to KNR from 1986-91 averaged W37 billion annually. They stem from the Government's political and social welfare objectives and are offered on a case-by-case basis. After 1991, the Government discontinued them and, in 1992, KNR had a deficit of W80 billion (Table 5-1). Instead of permitting a fare hike, the Government paid off KNR's long-term domestic debt and since 1993, the railroad has no long-term debt (it continues to pay on foreign debt). This arrangement relieved the railroad of immediate financial pressures, but it leaves in place

price distortions which affect the number of travellers and their choice of mode, and ongoing financial pressures associated with the underpriced services.

Table 5-1: KNR Revenues and Expenditures 1990-1993

Account Classification	1990	1991	1992	1993 (Estimated)
REVENUES				
Operating Revenues	828.1	962.6	991.8	1,118.5
Passenger	478.8	583.0	639.2	721.5
Freight	257.8	310.9	310.8	352.1
Parcel and Other	34.2	40.6	41.7	44.9
Government Subsidies	57.9	28.1	--	--
Non-Operating Revenues	25.6	33.3	44.1	71.5
Rental	13.3	16.1	20.5	26.1
Other	12.3	17.2	23.6	45.4
Non-Current Revenues	26.0	31.7	35.2	38.0
Total	879.7	1,027.6	1,071.1	1,228.0
EXPENDITURES				
Operating Expenditures	858.8	999.5	1,109.0	1,179.5
Personnel Expenditures	432.1	527.8	663.3	704.6
Asset Expenditures	294.7	326.6	343.1	354.0
Other Expenditures	132.0	145.0	102.6	120.8
Non-Operating Expenditures	1.3	2.0	2.0	2.2
Personnel Expenditures	0.6	0.7	0.8	0.8
Asset Expenditures	0.4	0.7	0.8	0.9
Other Expenditures	0.3	0.6	0.3	0.5
Non-Current Expenditures	21.8	27.7	40.6	45.4
Total	881.9	1,029.2	1,151.7	1,227.1
NET INCOME (With Subsidies)	-2.1	-1.5	-80.5	0.9

Source: Korea National Railroad.

5.6 These constrained prices, along with the growth in population and real income, contributed to significant shifts in the distribution of passenger travel. For example, when the Seoul-Pusan and Daejon-Gwanju expressways opened in the early 1970s, competition by long distance road transport was intense (largely by bus services). But growing congestion along the expressways in the 1980s made bus transport less attractive, while the demand for rail passenger service rose--

particularly for first and second class service (in response to the rise in personal incomes and demand for greater mobility). As shown in Table 5-2, from 1985-90, expressway bus travel decreased at an annual average rate of about 0.2% while first and second class rail volumes increased at an annual average rate of 27% and 18% respectively; also, air transport grew by 23% annually, and third class rail grew at only 4%.

Table 5-2: Passengers Carried by Mode in Seoul-Pusan Corridor (in thousands)

Year	Freeway Bus	1st Class Rail	2nd Class Rail	3rd Class Rail	Air
1985	32,142	1,863	13,230	25,418	1,111
1987	32,818	3,732	20,849	24,809	1,530
1989	33,375	5,467	26,786	27,560	2,568
1990	31,870	6,280	30,820	31,050	3,134
Annual Rate of Increase	-0.2	27.5	18.4	4.1	23.3

Source: MOT, *Statistical Yearbook of Transportation*, 1992.

Table 5-3: Minimum Required Time for Reserving a First Class Rail Ticket for Seoul-Pusan Corridor

Stations	Weekdays	Weekend	Peak Season
Seoul	7 days	11 days	4-6 months
Daejeon	3 days	10 days	4-6 months
Daegu	3 days	12 days	4-6 months
Pusan	5 days	14 days	4-6 months

Source: E. Shon; *Transport Related Prices: Taxes, Charges and Tariffs*, Paper presented at Seminar, December 1991, Table 4, page 4.

5.7 The rapid growth in the first and second class rail travel and the air sector significantly strained supply. As an example, the minimum required time for reserving a first class rail ticket for Seoul-Pusan is seven days for weekdays and 11 days for weekends (see Table 5-3).

5.8 Freight rates are also subject to Government approval. Due to inflation and factors such as changes in traffic types and patterns, prices have had to be adjusted: Since 1981, prices increased every year (Table 5-4). Since 1991, passenger rates were increased annually by 10%-12%, while freight rate hikes, which have varied a bit more, averaged around 10%. However, these changes have largely adjusted for inflation, rather than price structure.

5.9 The need for Government approval to alter prices has put KNR at a disadvantage in competing with truck transport and setting rates on a market-based basis. Although KNR sometimes discounts freight rates, usually it does not negotiate tariffs. Changes are largely requested to cover

costs but are not differentiated in terms of costs related to specific factors such as volume, load factor or type of commodity. And, not all tariffs cover costs: For example, those for coal and cement are said to be unprofitable, while those for containers do make profits. Current rates are structured around a base freight rate of W1,326 per ton per 50 km. Shippers get a 25% discount if they have private wagons, and the military has a base rate of W1,274 per ton per 50 km. Full car load rates range from 30 tons to a maximum of 54 tons.

5.10 These policies contrast sharply to those of commercial railroads in North America, which are acknowledged to be the world's leaders in profit-making freight operations. Pricing freedom for railways emerged in Canada after 1967 and in the United States by 1980. Since deregulation, freight rates are often negotiated directly with customers with services modified to meet their particular needs.

Table 5-4: KNR Tariff Increase Experience
(Thousand Passengers per Day)

Year & Month	Actual Experience					
	Percent Increase in Tariff				Cost Recovery (W100 million)	Annual Rev. Deficit (W100 million)
	Passenger	Freight	Parcel	Average		
81-6	13.5	22.3	15.0	16.6	456	-47
81-12	5.0	11.9	10.0	7.6	323	-411
82-7	5.0	4.7	5.0	4.9	111	111
82-12	4.5	6.7	7.0	5.4	231	-348
83-12	2.2	12.0	12.0	6.6	323	-17
84-8	1.5			0.8	39	39
85-5	0.4	5.3	5.0	2.6	97	-40
90-12	10.6	15.0	20.0	12.1	1,018	318
92-7	12.0	7.0	10.0	9.8	368	-691
93-2	10.2	8.5	8.0	9.5	1,007	-415
94-1	10.1	10.0	5.0	9.8	1,151	-44

Source: Korea National Railroad.
Note: No tariff changes shown from 85-5 to 90-12.

5.11 In 1987, the Government debated KNR's conversion into a semi-autonomous entity but postponed this for the future. Now, it is scheduled to be converted to a public corporation by 1996.

5.12 The question of subsidizing passenger fares has yet to be resolved by the Government. From an economic point of view, it is essential to clearly identify subsidies separately so that transport costs can be accurately understood. One approach that provides this information is the concept of PSO, which also allows operating costs to be developed at a disaggregated level independent of any costs associated with social welfare or other non-transport objectives. However, the Government has been reluctant to adopt a formal policy like this, preferring to provide lump sum relief (such as debt reduction) on a case-by-case basis.

5.13 When Governments provide subsidies, it is important that the policy be explicit, so that authorities fully recognize the costs and tradeoffs. But, explicit arrangements are not always popular with governments precisely because they represent a clash between politics and economic performance and force openness and greater accountability. Second, subsidies may relieve a company's financial burden (caused by an uneconomic service), but they retain the accumulating distortions of uneconomic price signals, which encourage excess use of the service and at the same time make it unattractive to the supplier because of the uneconomic rates. Indeed, part of the current pressure on Korean transport capacity reflects past subsidy policies that stimulated uneconomic traffic and left the carriers less able to accommodate demand.

5.14 **High Speed Rail.** The Government plans to implement a HSR project on the major corridor of Seoul-Pusan. The rationale is to meet expected travel demands over the next 20 years by reducing the volumes on the existing expressway and airport facilities in both Pusan and Seoul. The HSR is expected to attract passenger traffic from both, but will not provide freight service.

5.15 Analysis of trip data for 1988 provides insight into the scope of demand. Based on a survey of passenger trips on the Seoul-Pusan corridor, approximately 70% of daily trips were short-distance, of which 68% were by car or bus. The split between car and bus was 22% and 46% respectively, indicating the important role of inter-city bus service (see Korea High Speed Rail Authority, May 1992).

5.16 More important to the HSR was the long-distance market, which, in 1988 was estimated to account for 30% of daily passengers in the corridor. Rail service accounted for 5.5%, expressway car and bus transport for 24.3% and aviation for only 0.2%. Again, expressway buses showed a high market share, close to 20% of the long-distance market.

5.17 In terms of market demand, the success of the HSR will depend on its capacity to divert traffic from both the highway and aviation. Important factors will be the growing congestion on the Seoul-Pusan Expressway as well as the supply of air service and ease of ground access to the airports. Table 5-5 summarizes the daily passenger volumes estimated for both the "with" and "without" HSR scenarios. By 2011, HSR is expected to divert over 90% of the projected traffic for the expressway buses and automobiles using the corridor. The estimate seems to be highly sensitive to the time savings and convenience attributes. In terms of price, it is less clear, since the air sector is the only mode for which the HSR may compete. Based on general experience with HSR elsewhere (particularly in the United States), the differential between HSR and aviation is not likely to be very large.

5.18 The range of the potential difference may be seen in current fares per km. According to the 1992 KOTI Final Report, the fares per km (won) for the Saemaul train, express bus and airplane at the time of the study were W32.13, W12.12 and W64.07, respectively. Thus,

the HSR fare is expected to be higher than the Saemaul train. With modest levels of road and ground congestion, price diversion and stated preference analysis in other studies, the HSR fare could be as high as 80%-90% of the air fare. However, high levels of congestion on substitute modes would allow the HSR price to be even higher than air fares. Ultimately, the level will depend on whether the goal is to maximize revenue or social welfare objectives, and will also vary depending on trip length, speed and other trip and mode characteristics.

5.19 A further complication in predicting market shares and revenues for HSR is its possible impact on congestion levels on other modes. The predicted diversion rates of about 90% seem unusually high. However, if accurate, these could reduce congestion on alternative modes, thus reducing HSR's relative advantages in terms of savings in time. Because of the strong relationship between pricing policies, capacity and market share among modes on the Seoul-Pusan corridor, pricing policies for HSR or any one mode cannot be discussed in isolation; rather, mode substitution must be considered; over estimating the projected diversion to HSR would cause major misallocation of resources.

5.20 Based on recent revisions in the HSR project, construction/capital cost estimates indicate a total of W10.7 trillion will be spent from 1993-2001. Given the magnitude of the investment, it is important that the Government develop an integrated financing and pricing strategy to meet specified service objectives. Thus, without more detailed forecasts of prices, costs and diversion rates, it is difficult to predict the impacts of HSR on the Seoul-Pusan corridor traffic *or* the financing requirements of the HSR (which could include the need for subsidies).

Highway Transportation

5.21 Highway transport includes travel by personal car and commercial transport modes. The key pricing issue regarding motor car use is the level of user charges, primarily fuel taxes, which are discussed in the section on highway infrastructure. The present review of pricing practices is confined to the two main commercial transport markets on highways: bus travel for passengers and trucks for freight transport.

5.22 **Inter-Urban Bus Pricing.** In general, land transport pricing is based on Government requirements spelled out in considerable detail by regulations. Inter-urban bus fares are approved by the MOCT, but in the end, the more crucial approval must be obtained from the MFE. However, a recent change in regulations has shifted approval authority for local and suburban buses from MOCT to the cities. The MFE continues to hold overriding authority.

5.23 To obtain a fare change, bus operators must submit justification reports which cover all aspects of costs and operations. Because of their complexity, the national or regional bus associations prepare them for each city and/or inter-city operator.

5.24 Distance-based rates are used for inter-city bus services. Base fares are adjusted for road conditions (such as paved or unpaved), trip distance and the level and type of service (see Table 5-6).

5.25 In terms of types of service, express buses operate between urban areas and are generally non-stop. Some also make intermediate stops. In addition, intermediate bus services are available for the provinces and provide both non-stop or intermediate stop services. Data from the

National Bus Association indicates the non-stop buses have an average trip length of 27 km in contrast to the non-stop express buses, with average trip lengths of 216 km.

5.26 A review of fare changes from 1961-93 indicates a relatively high degree of responsiveness to cost changes, especially under inflationary conditions (Table 5-6). Over the 32 years, fare changes for the intermediate services were, on average, authorized every other year. However, from mid-1979 through the end of 1980, five fare changes were allowed, undoubtedly associated with the 10%-15% consumer price increases of the period.

5.27 A review of the fare change data for the non-stop and intermediate-stop express buses for 1969-93 reveals approximately the same relative frequency of changes, including the multiple changes made in 1979 and 1980. In addition, fare charges linked to trip length are also shown with factors classified into three trip-length groups: 1-200 km, 201-400 km and 401 km or over. The relationship between the adjustment factor in each of the three (using the 1-200 km class as the base) indicates the 201-400 km and the 401 km and over classes were 92% and 83% of the base group. This relationship remains the same throughout the roughly 24-year period.

5.28 An important factor is that for both the intermediate and express service, no change occurs in the rate structure to reflect paved and unpaved roads or service types. However, given the improvements in bus technology, it is surprising that the rate structure would remain unchanged.

5.29 Although the fare-setting approach considers important variables related to costs, rates are not set in the context of market competition and efficiency; and, as the inter-city bus sector is privately owned and operated, efficiency could be increased considerably if a more market-oriented price structure were permitted along with fewer restrictions on entry and constraints on operations. At the same time, the sector would need safety regulations. However, such services throughout the developed world operate with significantly less Government control, and are able to provide efficient, safe and relatively low-cost service.

5.30 **Inter-Urban Trucking.** Korea has five types of commercial trucking operations: regional, national, special vehicle, scheduled route and small vehicle (under 1 ton) service. The overall structure and organization of the sector is relatively complex, and a summary overview is provided in Table 5-7. Individuals and companies own trucks and are an important part of transportation, but few statistics are available.

5.31 By 1992, non-commercial or private trucking carried almost five times more tonnage than did commercial carriers, and 2.5 times more ton-kms of freight (Tables 2-1 and 2-2). Moreover, the share of total tonnage carried by private trucking has risen while that of commercial carriers has declined. Privately operated trucks are expected to have lower utilization than commercial carriers (because they cannot solicit traffic for empty hauls); however, the continued growth and large share of non-commercial trucking is evidence of the inability of the regulated commercial trucking sector to respond to market demands. This was also the experience with regulated trucking in the United States and was one of the factors which led to deregulation of the U.S. motor carrier industry.[1]

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[1] Under U.S. trucking regulation (prior to 1980), restrictions on entry and commodities translated into high costs for commercial carriers. Thus, many non-transport companies invested in their own fleets despite poor utilization. After deregulation, private trucking declined considerably and many private fleets were modified to engage in some commercial operations. Private fleets were permitted to solicit traffic on their empty backhauls. The net result is lower costs both to private fleets and commercial carriers which are freer to increase utilization. (Winston, et al., 1990, Chapter 3).

Table 5-5: Korea Transport Sector Policy Study High Speed Rail Traffic Forecasts by Mode (1991-2028)
(Thousands Passengers per day)

Modes & Scenarios	1991	2001	2011	2018	2028
Aviation					
No HSR	30	36	54	70	102
Basic HSR	10	11	16	20	29
Expressway Bus					
No HSR	1,159	1,777	2,411	2,684	2,834
Basic HSR	115	128	179	206	217
Automobile					
No HSR	689	821	1,260	1,381	1,472
Basic HSR	66	85	136	163	176

Source: Korea Transport Institute, *Korea High Speed Rail Construction Authority Technical Study of the Seoul-Pusan High Speed Rail System*, Final Report, Table 7-4, p. 54, May 1992.

5.32 Korea's commercial trucking sector can be classified into common and contract carriers that differ in the area they serve, how they serve it and the size of the vehicles used. Common carriers operate scheduled services using vehicles of all sizes. Contract carriers operate both nationwide and regionally, and serve manufacturing and other companies with their own vehicles. Regional carriers include company, individual and for-hire services, each using vehicles ranging from under 1 ton-5 tons (see Table 5-7). The overall size and trend for each category is shown in Table 5-8.

5.33 Although the industry is generally in the private sector, regulations cover all aspects of operations and pricing. As with inter-city buses, truckers are required to advise MOCT of proposed rate hikes and submit reports that include operating cost data. The reports are often prepared by the regional or national truck association.

5.34 Moreover, although a requested tariff or increase is related to operating costs, the justification (and the basis for the approval) is based on a national average operating cost which clearly results in some truckers profiting and others losing (if it is approved). Based on information obtained from the National Trucking Association, MOCT makes the decision, subject to MFE's approval.

5.35 Despite the presence of this highly structured system for pricing, truckers tend to use prices that more closely reflect their actual operating costs and in some instances their marginal costs. For example, the National Truckers Association noted that many truckers accept a lower rate when an empty return is involved; where volume is potentially available, they provide discounts; and frequently, truckers provide special rates where large volumes of traffic are offered for a long period of time. The latter contract rates are legal; however, all other discounted rates are illegal although the Government does very little to stop the practice.

Table 5-6: Index of Inter-city Bus Fare Changes Republic of Korea 1961-1993

A. Intermediate Bus Services

Year & Month	Base Fare		Cost Adjustment Factors			
	km	Won	Intermediate Bus-Stop		Intermediate Bus-Non Stop	
			Paved	Unpaved	Paved	Unpaved
61-3	6	10		1.10		
66-7	8	10	1.33	1.48		
67-12	8	10	1.99	2.22		
69-12	8	20	2.49	2.78		
72-2	8	30	3.21	3.59		
74-2	8	40	4.45	4.98		
75-7	8	45	5.18	5.90		
78-6	8	60	6.73	7.53		
79-5	8	80	8.78	9.83		
79-12	10	100	10.31	11.55	10.93	12.24
80-2	10	100	10.31	11.55	12.01	13.43
80-8	10	120	12.95	14.51	13.73	15.36
80-12	10	120	12.95	14.51	13.73	15.36
81-6	10	130	14.27	16.00	15.13	16.93
82-12	10	140	15.61	17.51	15.61	17.51
85-12	10	150	16.82	18.88	16.82	18.88
86-3	10	150	16.42	18.44	16.42	18.44
89-2	10	170	18.75	21.06	18.75	21.06
91-2	10	210	23.06	25.90	23.06	25.90
92-2	10	260	28.62	32.14	28.62	32.14
93-1	10	310	34.49	38.73	34.49	38.73

B. Express Bus Services

Year & Month	Cost Adjustment Factors				
	Express Bus-Non Stop			Express Bus-With Stops	
	1-200 km*	201-400 km	401 km or over	1-200 km*	201 km or over
69-8	-	1	-	-	0.9
72-2	-	1	-	-	0.9
74-2	-	1	-	-	0.9
75-7	1	0.92	0.83	1	0.92
77-7	1	0.92	0.83	1	0.92
78-6	1	0.92	0.83	1	0.92
79-5	1	0.92	0.83	1	0.92
79-12	1	0.92	0.83	1	0.92
80-2	1	0.92	0.83	1	0.92
80-12	1	0.91	0.83	1	0.92
81-6	1	0.91	0.83	1	0.92
82-12	1	0.91	0.83	1	0.92
85-12	1	0.91	0.83	1	0.92
86-3	1	0.91	0.83	1	0.92
91-2	1	0.91	0.83	1	0.92
92-2	1	0.91	0.83	1	0.91
93-1	1	0.91	0.83	1	0.91

* 1-200 km is the base value.

Table 5-7: Regulated Motor Carrier Classification

	Zone		Vehicle
Common	Scheduled lines		All
Contract	Nationwide		All
	Regional	Company	Above 1 ton
		Individual	1 ton to 5 ton
		For hire	Under 1 ton

5.36 While new entry is in principle possible, with conditions relating to a minimum fleet size and financial stability, in practice few new licenses are issued. In the absence of competitive pressure, operators get together to coordinate their activities. Poor routes are subsidized by good ones, which reduces the quality of service where demand is greatest and gives inappropriate signals on locational decisions.

5.37 Individual private owners (under the zonal contract category) must operate with a vehicle of under 5 tons, and since 1989, the number of such operators has been relatively constant at about 27,000 (Table 5-8). Comparable stability may be found for individual owners in the for-hire category. Many of them pay a fee to trucking companies in order to be reported as a company truck. This is illegal but again, the Government appears to tolerate the practice. Private truckers who link to the companies obtain business either on their own or from a broker and do not appear to rely on the company with which they are affiliated. No information exists on how important these private/company linkages are but their scope must be widespread. One estimate suggests that as many as 50% of private trucks operate as commercial trucks.

5.38 Nation-wide truckers are of relatively recent vintage, and growth in licenses and companies has been relatively slow (see Table 5-8). The most rapid growth has occurred in the contract-within-zone and the for-hire category. However, whatever the category, the regulatory requirements tend to be ignored where a more competitive response is available. From the point of view of efficiency, the lack of enforcement regulations regarding operating rights and pricing is all to the good in terms of promoting more competitive market behavior and economic pricing. Nonetheless, the presence of rules and regulations that may or may not be enforced adds uncertainty to the industry. Thus, it would be preferable to have explicit policies that promote competition and efficiency rather than rely on bureaucratic ineptitude or policy neglect to provide needed market freedom.

5.39 In summary, although the motor carrier industry plays a major role in the Korean economy, it could perform more effectively if current regulatory restrictions were relaxed. This would result in significant productivity increases and more economic use of the sector's current resources. At present, prices and service decisions are only loosely related to specific costs and market conditions. Relaxing entry controls would enable trucking companies, large and small, to identify and link together market segments into a viable operation. The complexity of the sector requires that operators be free to identify and service various markets, and select the appropriate size

and type of equipment and scale of operation. Freight rates can be linked to the value of the products, the cost of transporting the commodities, the need for speed in order to prevent spoilage or related damage, and the scope of competition within the mode as well as between modes.

Table 5-8: Truck Vehicles by Operating Class (1980-1992)

Year	Nationwide		Contract within Zone			Specialized	
	No. of Company	No. of License	No. of Company	No. of License	Individual	No. of Company	No. of License
1980			757	36,420	0	191	3,479
1981			890	37.524	-	205	4,900
1982			809	37,595	0	254	6,923
1983			864	39,430	0	344	10,741
1984			886	40,801	0	385	6,277
1985			905	41,345	173	416	6,544
1986			907	41,499	8,649	472	7,546
1987			992	49,641	12,324	380	4,530
1988	1	847	1,047	54,926	16,942	360	5,286
1989	1	676	1,103	44,533	25,856	404	4,952
1990	2	670	1,085	46,096	28,456	585	7,612
1991	3	814	1,146	51,756	27,022	682	10,715
1992	5	994	1,170	58,314	27,040	888	13,153

Year	For-Hire			Common		Total		
	No. of Company	No. of License	Individual	No. of Company	No. of License	Individual	No. of Company	No. of License
1980	297	14,561	-	30	1,906	1,275	56,366	0
1981	263	1,283	14,561	29	1,866	1,286	44,573	14,561
1982	529	2,435	14,561	26	1,428	1,618	48,291	14,561
1983	803	3,424	14,561	25	1,348	2,036	54,943	14,561
1984	886	4,378	14,559	28	1,394	2,185	52,800	14,559
1985	970	5,473	14,112	25	1,442	2,316	54,804	4,285
1986	1,026	5,851	14,112	25	1,467	2,430	56,363	2,761
1987	972	3,719	16,750	25	1,496	2,369	63,386	9,074
1988	778	2,523	18,723	25	1,713	2,211	65,295	5,665
1989	709	2,448	19,106	25	1,487	2,242	54,096	4,962
1990	704	2,746	19,398	25	1,465	2,401	58,589	7,854
1991	688	3,024	19,824	23	1,834	2,542	68,143	6,846
1992	671	2,915	20,507	23	1,873	2,757	77,249	7,547

Source: MOT, *Statistical Yearbook of Transport*, 1986-1993.

* Size restriction: Contract within Zone: above 1 ton; Individuals: above 1 ton, less than 5 tons; for hire: less than 1 ton.

Highway Infrastructure

5.40 Highway infrastructure costs are recovered from either user charges such as taxes, special fees and licenses or the direct payment of a fee at the time the road is used. These two approaches are often used together with some overlapping taxes where toll roads are involved (toll road users pay both the toll and fuel taxes).

5.41 User charges consist primarily of gasoline, diesel and excise taxes. These taxes have represented about 3.5%-4.0% of total Government revenues, with some increase recently--largely due to dramatic increases in vehicle ownership. Trends in user charges and financing are discussed in Chapter VI.

5.42 **Toll Roads.** The current toll expressway system is managed by the KHC, which is responsible for planning, operating and building new expressways. From 1983-92, the toll expressway system increased from 1,245 km to 1,644 km for an average annual rate of 3.1% (Table 5-9). Over the same period, the traffic, measured in terms of the average number of vehicles per day, increased from 9,300 to 33,400--an annual average increase of 15.3%.

5.43 Given the relatively slow growth rate of the expressway network (measured in route miles) as compared to traffic, certain major routes such as Seoul-Pusan, Seoul-Inchon, Taejon-Kwangju and Pusan-Kwangju have become seriously congested. From 1986-91, the time required to travel between Seoul-Pusan on the Kyong-Bu expressway doubled from seven hours to 14 hours during peak conditions. Similar increases in travel times were recorded for Seoul-Inchon on the Kyoung-In expressway.

5.44 With regard to KHC's financial experience, toll revenues over 1988-92 increased from W238.7 to W623.3 billion, for an annual average rate of 27% (see Table 5-10 for data on revenue and expenditure growth). At the same time, maintenance and administrative costs increased 15% annually, resulting in a rapidly growing toll revenue surplus (growing at an annual rate of about 27%). However, it is evident from the table that the surplus was insufficient to cover scheduled investment for new capacity and widening of existing expressways.

5.45 In 1988, W273.1 billion were spent on investments and the gap between the revenue surplus and investment needs was closed through a Government subsidy and borrowing. In that year, a Government subsidy (in the form of equity), loans (including bonds) by KHC, along with other sources of funding accounted for over W221 billion to be used for the required investments. A review of the experience after 1987 shows that borrowing increased rapidly (see Annex 2). Because of the lack of a long-term bond market, KHC used short-term bonds to finance its operating and investment needs. The rapidly growing liability has obviously placed great pressure on KHC to find other means to finance the much needed investment already planned in the seventh Five-Year Plan.

5.46 **Setting Toll Rates.** Current requirements for setting toll rates are governed by the Toll Road Law. Toll rates are developed by the MOCT, but discussions are held with MFE where the rate hike is considered in terms of price stabilization. The proposed change is published for public comment, and MFE then makes its decision.

Table 5-9: Korea Road Network and Traffic, 1983-1992

Year	Tolled Expressways		National Roads		Provincial Roads	
	Length (km)	Average vehicle/day	Length (km)	Average Vehicle/day	Length (km)	Average Vehicle per day
1983	1,245	9,293	12,229	2,370	10,041	765
1984	1,421	9,877	12,244	2,720	10,079	640
1985	1,415	10,205	12,241	3,258	10,167	793
1986	1,415	11,397	12,258	3,898	10,313	993
1987	1,539	13,766	12,253	4,685	10,328	1,170
1988	1,551	15,465	12,255	4,880	10,577	1,279
1989	1,551	9,344	12,190	5,893	10,558	1,646
1990	1,551	22,875	12,161	6,875	10,672	2,033
1991	1,597	28,140	12,110	8,363	10,166	2,580
1992	1,644	33,362	12,064	10,425	10,741	3,367
Annual Average Growth 1983-1992	3.1%	15.3%	0.2%	17.9%	0.8%	17.9%

Source: Korea Transport Institute, *Midterm Financing Report*, 1993, No. 93-22, Tables 2-3 and 2 and 2-4.

5.47 Toll rates are set using a range of criteria, some of which meet the economic rationale for pricing the uncongested roads described above. In general, tolls are set on a basic price per km plus a user charge called "interchange cost (IC)" that reflects the toll collection and operations and maintenance costs related to an interchange, and an added factor based on the benefits accrued to each user category. Rates are calculated on a per km basis, and the basic unit charge and the IC are currently W100 and W200 per km, respectively. Different rates are set for each vehicle category (cars, trucks and buses), and the level of service of the road, measured by the number of lanes (see Table 5-11). The base rate for each vehicle type is determined for a four-lane highway but adjusted upwards (20% higher) for six-lanes and downward (20%) for two-lanes. The toll structure is supposed to reflect benefit criteria which are measured in terms of time and cost savings for vehicles using expressways instead of a similar width (four-lane) national road. There is no economic justification for using this measure in setting toll rates, other than estimating the level of cost recovery.

5.48 **Tolls on Uncongested Roads.** Where congestion is not present or where new capacity is being considered, it appears that economic feasibility studies are conducted to justify investments. Setting rates is a way of pricing that maximizes the benefit basis on which the road was

economically justified, that is, low toll rates to encourage utilization. This would mean setting tolls at marginal costs--generally using variable maintenance costs as the surrogate value. However, on a more pragmatic basis, a toll based on total maintenance costs is sometimes used. The underlying principle is that a good part of the benefits of the road accrue to the public at large in the form of development, and as long as the road is not congested, it is argued that the price need not and indeed should not be set to recover the full cost of the investment. A significant part of the benefits is seen as a contribution to the public good, and hence the investment costs (other than those recovered from marginal cost pricing) should be recovered out of general revenues without being levied on highway users specifically.

5.49 A key economic criterion in setting toll rates is the extent to which traffic responds by diverting to a free alternative. Where diversion levels are reasonably low, it is feasible to apply (without a significant loss of social benefit), a modified marginal cost approach where toll rates are set so they cover (a) toll collection and related costs (operating costs, administration and general expenses); (b) medium-term maintenance costs (including overlay and resurfacing); and (c) incremental toll-related capital costs (booths, extra lanes, etc.). These criteria provide a reasonably sound basis on which to set tolls.

5.50 **Toll Rates, Long-Run Marginal Costs and Cost Recovery.** There are clear indications that toll rates do not adequately reflect the capital costs associated with construction of Korean expressways. To more effectively mobilize the resources needed to meet the demand for expressway service, toll rates must be modified to reflect both actual costs as well as the external congestion costs experienced on the toll expressway network.

Table 5-10: KHC Flow of Funds (1988-1992)
(Won billion)

Item	1988	1989	1990	1991	1992
Revenue From Operations	238.7	283.7	348.7	450.6	623.3
Maintenance & Admin. Expense	92.6	94.2	112.0	143.0	166.3
Govt. Subsidy	45.0	80.0	84.1	240.7	98.5
Depreciation	129.0	163.8	194.1	152.5	375.4
Interest Payment	7.7	5.1	3.9	3.0	32.2
Net Income Before Subsidy/ Interest/ Depreciation	146.1	189.5	236.7	307.6	457.0
Net Income	51.7	91.1	103.2	356.6	135.0
Investment	273.1	350.0	524.3	1,319.6	1,790.4

Source: Korea Highway Corporation.

Table 5-11: Toll Structure for KHC Roads

Class	Vehicle Class	Base* Price	Benefit**	Base Price/ Benefit (%)
1	Passenger car < 16 pers.	27	180.1	15.0
	Bus < 2.5 tons	27	180.1	15.0
2	Bus > 17 pers.	46	212.2	21.7
3	Truck > 2.5 < 10 tons	30	270.0	11.1
4	Truck 10 tons and >	60	376.5	15.9

Source: Korea Highway Corporation.

* Based on four-lane highway.
Price adjustment factors for level of service (No. of lanes):

Two-lanes	=	80%
Four-lanes	=	100%
Six or more lanes	=	120%

** Measured in terms of savings in time and costs for vehicles using expressway instead of a national road of similar width (four-lane).

5.51 Considerable evidence exists that toll rates do not cover full costs. Table 5-12 shows representative toll revenues along with construction and maintenance costs for a four-lane expressway from 1979-90. The data show a gap between tolls and costs since 1979; and although tolls were increased in 1991, this did not close the gap. The rapid rate of vehicle traffic growth on expressways suggests the appropriate charge should reflect the long-run marginal costs (LRMRC) of added road capacity. LRMRC may be developed by estimating the cost of providing an added increment of capacity. Although a broad range of information is available concerning expressway costs and revenues, inconsistencies and differences in data sources make it difficult to develop reliable estimates. Nonetheless, an order of magnitude estimate was possible to indicate the relationship between LRMRC and representative toll revenues. Using data from KHC and KOTI, Table 5-13 shows marginal road costs compared to toll revenues. The results indicate how low toll charges are, relative to the total operating and capital costs of providing expressways.

Table 5-12: Toll Revenues, Construction and Maintenance Costs for Tolled Expressway 1979-1990

Year	Toll Revenues	Const. & Maint. Costs	Revenues-Costs
1979	10,189	6,192	3,997
1980	45,411	47,154	-1,743
1985	126,152	177,871	-51,719
1990	323,292	378,241	-59,949

Source: KOTI, E. Shon, *Financing Transport Infrastructure in Korea*, paper presented at a symposium in Seoul, Korea, September 1992, p. 4, Tb 2-3.

Table 5-13: Estimated Long Run Marginal Toll Expressway Costs and Revenues, 1983-1992
(For a four-lane expressway in W billion per km)

Source	Cost					Revenues
	Construction + Land	O&M	Annualized @ 10% construction	Annualized @ 10% O&M	Total cost/km	Toll revenues/km
KOTI	27	1	2.7	0.1	2.8	0.35
KHC	25	1	2.5	0.1	2.6	0.35

Note: Calculation of total revenues based on 1992 revenues of W569.823 billion from expressway toll revenues for 1,644 total expressway km.

Table 5-14: Korean Inter-city Expressways Congestion Conditions 1988-1992

Variable	1988	1989	1990	1991	1992
Expressways (in kms)	1,551	1,551	1,551	1,597	1,644
Congestion Cost (W million)					
a. VOC	31,204	51,741	64,641	130,075	166,212
b. PAX Time	37,914	58,481	71,538	143,537	184,724
c. TOTAL COST	69,118	110,222	136,179	273,612	350,936
Vehicles Per Day	15,465	19,344	22,875	28,140	33,362
Vehicles Per Year ('000)	170,660	217,609	265,174	309,342	392,647
Congestion Cost Per Vehicle (Won)	405	506	514	885	894
Congestion Cost Per Expressway (W million)	45	71	88	171	214

Source: Korea Highway Corporation and Korea Transport Institute, Statistical Annex, prepared for the World Bank Study Mission.

5.52 Empirical studies have shown that as load per axle increases, the amount of damage to the pavement rises exponentially. Therefore, efficient pricing for road damage calls for "steeply graduated per-mile tax based on axle weights" (Newberry, 1988). For example, such a graduated per-mile tax, which takes into account both weight and axle configuration, has been in effect in New Zealand for years. Also, Iceland, Norway, Sweden and several states in the U.S. implemented weight-distance charges. Box 5.1 describes the New Zealand structure of road user charges and is a useful example of basing road user charges on the costs of accommodating different vehicle types. A similar system of weight-distance charges, if implemented in Korea, would enhance the economic efficiency of road use and generate additional revenues.

Box 5.1 The Road User Charging System in New Zealand:

The road user charging system in New Zealand, as laid down in the Road User Charges Act 1977, operates as follows:

a. Government policy is that all expenditure by the National Roads Board (which covers funds spent directly by NRB through state highway expenditures, as well as grants and subsidies to local authorities)* should be recovered from users in the form of a charge for use of the road network. The charge is set to cover all annual expenditures (both current and capital) and is referred to as a "pay as you go" system.

b. Annual costs are recovered from users by allocating costs to the different vehicle types as follows:

i) Driver related costs (signs, markings, landscaping, etc.): allocated on the basis of vehicle km.
ii) Space related costs (capacity and speed improvements, etc.): these are allocated according to licensed weight (which is a surrogate for PCUs times km travelled).
iii) Strength related costs (strengthening, pavement wear, bridge loadings, etc.): allocated on the basis of the fourth power law times km travelled).

c. Costs are allocated to driver, space and strength on the basis of the type of usage or improvement which gives rise to the need for each item of expenditure.

d. Costs are recovered from vehicles as follows: a) cars and light vehicles are powered predominantly by petrol; all petrol powered vehicles under 3.5 tons therefore pay a fuel tax; and b) heavy vehicles are powered predominantly by diesel fuel; however, since a diesel tax would not adequately differentiate between the costs imposed by different vehicle types, it was decided to introduce a ton-km charge.

e. The ton-km charge is implemented through use of sealed and licensed hub-odometers. Licenses are purchased in advance in multiples of 1,000 km and the km charge is based on the axle weight of the vehicle (assuming the nominal gross weight will apply for 50% of the distance travelled).

f. Tax levels are revised each year to generate the revenue required to meet the proposed annual expenditure plan. In setting the levels and consulting the major user groups, the Board has become mindful of the fact "that they can only charge what the market can bear, not what they may wish to spend." This has led to greater accountability and a trend has occurred towards more cost-effective works and the deletion in annual programs of inessential minor works.**

g. Import duties, rates sales and license fees are not treated as road user revenues. The former two are regarded as general taxes; license fees are low and (presumably) do little more than cover the cost of administration.

* Expenditure of Local Authorities funded separately from local rates, etc., is excluded on the grounds that users have already paid for it.

** R.B. Fisher, Road Funding and Vehicle Taxation in New Zealand, 13th Australian Road Research Board Meeting, 1986.

Source: Ian Heggie "Brief Notes on Charging for Road Use in Developing Countries", World Bank Paper, Jan. 1989.

5.53 **Setting Tolls on Congested Roads.** Under congested road conditions, user charges should include the avoidable road maintenance and capacity costs and the costs imposed on other users (i.e., external congestion costs). Congestion has substantially increased on Korean expressways, especially between Seoul and Pusan (see Table 5-14). Congestion costs (including vehicle operating costs and value of time delays) increased from W69.1 billion in 1988 to W351 billion in 1992. Expressed on a per vehicle per year basis, congestion rose from a cost of W405 per vehicle in 1988 to more than double that in 1992. Given the serious congestion on the toll expressways, there is a strong argument for applying congestion pricing particularly where sections pass through urban areas.

B. Pricing Practices and Policies for the Korean Aviation Sector

Domestic Airlines and Air Fares

5.54 Air traffic has been one of the fastest growing activities in the Korean post-war economy (see Chapter II). Commercial air traffic has always been dominated by KAL, which was fully privatized in 1969. The carrier enjoyed a virtual monopoly at home until the late 1980s, at which time Asiana Air (AAR) was established. This carrier now has a 25%-30% share of the domestic market. However, KAL continues to dominate heavily in spite of AAR's rapid growth and its increasing share of the short-haul international market (see Table 5-15).

5.55 The power for setting airfares and airport user charges rests in principle with the airlines and the Korean Airport Authority, respectively. However, the Price Stabilization and Fair Trade Act, for all practical purposes, has taken that autonomy away and vested decision-making with the Government through its MFE. While fares were deregulated in 1992, this was largely in principle only, because the domestic air transport market is still a duopoly and MFE continues to regulate fares.

5.56 To date, MFE has controlled prices in order to restrain inflation. This goal has taken precedence over economic efficiency or financial autonomy for the industry or entities. Thus, domestic airfares have been low for a long time, and even declined in real terms by some 20% between 1985-91. In fact, fares declined in real terms since 1975, although there was some increase between 1975-85, before the steady decline set in. For example, airfares in the most heavily travelled route (the 400-km long Seoul-Pusan corridor) are less than one half of comparable fares for the somewhat shorter distance in the high-density New York-Washington D.C. corridor (see Table 5-16). The average fare (won) per passenger-km for domestic air travel increased steadily in nominal terms since 1989, from W61/pass-km to W84/pass-km in 1992, but the revenue per seat-km declined in real terms because the system-wide occupancy rate gradually dropped.

5.57 The effects of the controlled prices can be seen in Table 5-17, which shows yearly revenues and expenditures reported by KAL and AAR. For 1989-92, both reported significantly better results for their international operations than for their domestic operations. Although cost allocation between domestic and international markets requires a careful examination, it is reasonably clear that both operators lost money from the domestic market in past four years.

5.58 While prices have remained low, costs have increased dramatically, and the airlines, as well as the other providers of services (such as the railway), must generate enormous resources to expand and maintain their infrastructure.

Table 5-15: Market Structure of Korean Civil Aviation; Percentage Share of Gross Revenue 1989-92

Airline & Market	1989	1990	1991	1992
Domestic:				
Korean Air	75%	68%	70%	73%
Asiana Air	25%	32%	30%	27%
International:				
Korean Air	100%	98%	94%	90%
Asiana Air	0	2%	6%	10%

Source: KAA, KOTI.

5.59 However, the scope for raising fares to compensate for the airlines' increased costs is constrained by competition from rail and highway. As the travel time for air and rail are not significantly different, operators could not introduce hefty price hikes without risking a substantial loss of patronage, particularly of non-business trips, to a competing mode. And, this would simply squeeze the financial position of the airlines even further--unless MFE permits the railways and freeway buses to substantially raise their fares as well (at least for luxury and first-class travel).

Table 5-16: Out-of-Pocket Costs of One-Way Travel Between Seoul and Pusan (400 km) Compared to New York-Washington, DC (340 km) (1994 Won)

Transport Mode	One-Way Cost (Won)		
	Seoul - Pusan	NY - Washington, DC	
Airfare	W36,200	W120,000	(peak)
Railway:		60,000	(off peak)
First Class	26,500	116,800	(peak)
Ordinary Class	21,500	76,800	(peak)
		47,200	(off peak)
Auto Toll (vehicle operating costs not included in cost estimate)	13,000	N.A.	
Bus:			
Luxury	13,870	N.A.	
Ordinary	9,250	36,000	

Source: KOTI.

Airport User Charges and Taxes

5.60 Capital costs of airport infrastructure (runways, terminals, etc.) are not recovered from user charges because they are presently treated as sunk costs. MOCT is responsible for submitting a budget proposal associated with an investment plan to MFE, which approves Government allocations for the investments.

5.61 However, KAA recovers recurrent costs for airport operations and maintenance through various user charges, such as fees for aircraft landing, parking and lighting, passenger taxes, car parking fees, and rental of terminal space for shops and restaurants (see Table 5-18).

Table 5-17: Yearly Financial Statements of KAL and AAR for 1989-1992
(billion won)

Year		Korean Air			Asiana Air		
		Intl.	Dom.	Other*	Intl.	Dom.	Other
1989	Revenue	1,400	147	89	-	42	-
	Costs	1,328	195	90	-	64	-
	Net Income	82	-48	-1	-	-32	-
1990	Revenue	1,516	163	86	34	75	-
	Costs	1,479	214	80	46	109	-
	Net Income	37	-51	6	-12	-34	-
1991	Revenue	1,784	224	89	116	94	-
	Costs	1,748	252	82	126	120	-
	Net Income	36	-28	7	-10	-26	-
1992	Revenue	1,842	312	290	210	115	-
	Costs	1,865	321	256	225	146	-
	Net Income	-23	-9	34	-15	-361	-

Source: KAL and AAR's Annual Reports, KOTI.
* Includes terminal use and refueling related fees.

5.62 Some user fees are market determined, such as rents for airport and terminal space, while others are based on discriminatory pricing, such as differential landing fees and departure taxes between international and domestic flights and passengers (see Table 5-19). Aircraft-related charges are structured according to the size (or weight) of the aircraft serviced.

5.63 **Passenger Departure Tax.** KAA levies a departure tax that is several times higher (7.2 times in 1993) on international than domestic passengers (see Table 5-19). This is probably based on the combination of the users' ability to pay and captiveness of the international travellers to the air mode. Although it is not uncommon for other airports to charge higher passenger user fees to international passengers, the magnitude of the difference is strikingly large.

5.64 Until 1992, no tax was levied on domestic passengers. Since then it has become by far the dominating revenue component of the domestic airports with a tax of W1,000 per departing passenger, and W2,000 since 1994. Passengers departing for foreign destinations pay a departure

tax four times the present domestic departure tax. It was W3,500 in 1983, 6,000 in 1990, 7,200 in 1992, and reached W8,000 in 1994. The discrimination between domestic and foreign departure taxes impacts heavily on the revenue-earning potential of different Korean airports. This is one major reason why Kimpo accounts for a large portion of the KAA's total revenue.

Table 5-18: Korean Airport User Charge Structure (December, 1993)

Type of User Charge		Won per Unit
Landing Fees		
Highest:	B747-400 International	1,764,612 per landing
	B747-400 Domestic	294,392 " "
Lowest:	F28 International	99,668 " "
	F28 Domestic	17,374 " "
Lighting Fees		
Highest:	B747-400	29,539
Lowest :	F28	17,729
Aircraft Parking Fees		
Highest:	B747-400 International	260,297
	B747-400 Domestic	130,149
Lowest:	F28 International	29,660
	F28 Domestic	14,830
Rent per m^2 of space(Term.2)		
Duty Free Shop		3,836,928
Restaurants		527,015
Retail Shops		494,880
Airline Offices		391,314
Domestic Terminal		
Restaurants		445,489
Retail Shops		334,312
Offices		299,450
Cargo Terminal		
Airline Offices		127,065
Land rents per m^2		
Passenger Terminal		29,522
Parking Area		24,648
Hangar		20,006

Source: KAA.

5.65 **Aircraft-Related Charges.** Landing fees constitute the dominant portion of aircraft-related charges paid by airlines at Korean airports. Other fees are for parking, mooring and lighting (see Table 5-20).

5.66 Unlike the policy with respect to fare increases, MFE has created a more liberal policy on airport user charges, one that is designed to generate revenue. Annual increases have been quite in line with or above the national rate of inflation for many revenue items (see Table 5-21).

Several of these are relatively recent, such as the domestic departure tax, which was introduced in 1992 and is now the dominant revenue earner for all the airports but Kimpo.

Table 5-19: Ratio of International to Domestic Airport Charges in Korea, 1993

Airport Charge	International/Domestic Charge Ratio
1. Landing Fees	5.5 - 6.0
2. Passenger Tax	7.2

Source: KAA.

5.67 International landing fees remain well below those of airports abroad for comparable aircraft, although they were significantly raised in 1990, 1992 and 1994 (to allow them to approach international levels). For example, the 1993 landing fees for a B747-200 aircraft in international traffic at Kimpo was only 68.4% of the average of 14 selected foreign international airports. The new landing fees effective from April 1994 are 73% of the average of the 14 (Table 5-22). However, domestic flights using the same aircraft pay only 17% of the landing fee of an international flight.

Table 5-20: The Aircraft Fee Structure in Korean Airports, 1993 Percentage Shares

Revenue Item	% Share of Revenues
Landing Fees	86%
Aircraft Parking Fees	5
Lighting Fees	7
Mooring Fees	2
Total	100%

Source: KAA.

Table 5-21: Average Annual Growth Rate of Airport User Charges in Korea, 1983-1994

User Charge Category	Average Annual % Change
1. Domestic Landing Fee	4.3
2. International Landing Fee	4.1
3. Aircraft Parking Fee	3.2
4. Lighting Fee	2.4
5. Mooring Fee for cars	5.0
6. Mooring fee for equipment	3.2
7. Domestic Passenger Tax	8.3
8. International Passenger Tax	9.0
9. Short Term Car Parking Fee	22.6
10. Monthly Car Parking Fee	7.5

Source: KAA.

5.68 Landing fees are calculated on a per ton basis, are high for weights below 10 tons, and increase almost 40% for those above 4 tons. The rationale for this is that regardless of an aircraft's size, it captures valuable airport time and space during landings and takeoffs. At the same time, it is known that investments and maintenance of runways and taxiways are a function of the size of the aircraft to be serviced. In fact, some argue that the dimensions of these facilities are determined by the largest aircraft to be serviced, and these should therefore pay proportionately more than mid-size aircraft. This is precisely what the Korean landing fee structure expresses: What is uncertain, however, is the extent to which the incremental landing fees correspond to incremental aircraft movement costs, as data are not available. Therefore, it is unknown if the 7.7 times higher landing fee and 5 times higher parking fee for a Boeing 747-400 compared to a Boeing 737 aircraft reflects the difference in the actual incremental costs.

5.69 The International Air Transportation Association (IATA) suggests that landing fees be weight-based. However, this practice is inconsistent with maximizing economic efficiency (or social benefit) when applied to congested airports. Kimpo experiences substantial congestion, and the merits of using weight-based uniform landing fees, regardless of time of day and day of week, must thus be reevaluated. Instead, some form of peak period pricing is likely to be better to both raise necessary funds for capacity investment and maximize economic benefits.

5.70 Lighting fees are continually progressive per ton, reflecting the assumed complexity and power need per ton of aircraft for those that are larger. The aircraft parking fee, on the other hand, is regressive per ton weight.

5.71 **Parking.** Car parking has become an important source of revenue at many airports around the world and its revenue potential has been recognized at Kimpo. The base car parking fee was increased by as much as 22.6 % per year since 1986, before which it was free. KAA's annual revenue from this source was W12,734 million (US$16 million) in 1993, which accounts for 7% of its total revenue. These fees will continue to be an important, and even increasing source of airport revenues.

International Comparison of Airport User Charges

5.72 Airport landing fees are about 68% of those in other countries (see Table 5-22), but are being increased to 73%. The 1993 Korean departure tax for international passengers was no more than 64.3% of the international level, and the aircraft parking fees at Korean airports were only 37.5% of the international average.

5.73 When comparing Korean airports to others in Asia, it appears that KAA could raise user charges, if necessary. Using Kimpo as the basis for comparison, Narita (Tokyo) has four times higher landing fees, Hong Kong and Singapore 20% and 10% higher, respectively, while Manila's are 17% less. For aircraft parking, Hong Kong charges three times more, Narita twice as much, Manila marginally less, and Singapore less than half. Similarly, departure taxes for international travellers are twice as high in Narita and Hong Kong, and slightly higher in Manila and Singapore. The fee increases as of April 1994 will not change these ratios significantly.

Table 5-22: A Comparison of Korean and International Airport User Charges
(1993 prices; Won equivalents)

Type of User Charge	Korean Fee (1)	International Average Fee Level (2)	Ratio: (1)/(2)
Landing Fee (B747-200)	1,565,806	2,290,172	68.4%
Aircraft Parking Fee	234,436	624,626	37.5%
Passenger Departure Tax	7,200	11,194	64.3%

Source: IATA, *Airport and Enroute Aviation Charges Manual* '93.12.22, and KAA.

Table 5-23: The Structure of Airport Revenues in Korea KAA's Annual Results 1989-1993 for the 14 Korean Airports
(billion Won)

Account Item	1989	1990	1991	1992	1993
Revenues:	71	97	117	148	184
- Rents	21	25	31	36	45
- Aircraft dues	22	30	37	49	54
- Facility dues	22	31	35	46	68
- Other income	6	11	14	17	17
Expenditures:	60	74	93	132	169
- Labor	24	31	39	48	57
- O & M	21	23	31	35	41
- Depreciation	9	10	14	32	41
- Other (incl.\taxes)	6	10	9	17	30
Net Result (after corporate taxes)	11	23	24	16	15

Source: KAA.

Cost Recovery

5.74 KAA has consistently profited from its overall operations (see Table 5-23). But, since the interest (or opportunity) cost on the investments in fixed assets has not been accounted for in KAA's expenses, it is difficult to establish whether it recovers the full cost of operations along with capital inputs. As investment capital comes from outside the KAA apparatus, only a limited portion of the depreciation on fixed assets appears in KAA expenditures. If depreciation and interest costs for the total past investments were considered, KAA would most likely have a large deficit.

5.75 The net result is that cost recovery (excluding the cost of capital input) has declined since 1991 in spite of a significant expansion of the revenue base and increased unit user charges. Since 1990, the accounting and budgeting responsibility for investments and depreciation was reorganized in such a way as to increase KAA's share of investments drastically, and with the Kimpo and NSMA investments in 1992, caused depreciation to rise rapidly in KAA's accounts.

5.76 Revenues are generated very unevenly among airports. Kimpo generates 78% of KAA's overall gross revenue, and runs a substantial operating profit.[2] This helps finance the large operating deficits of other airports (except Kimhae, which is roughly a break-even operation), and also contributes to the Government's general revenues by paying a 10% profit tax. Kimhae's share of the KAA's gross revenue is 10%, and Cheju's is 6%. The remaining 11 airports contribute no more than 4%.

Table 5-24: The Structure of Net Revenues at Korean Airports 1989-1993
(billion won)

Airport	1989	1990	1991	1992	1993
Kimpo	12	34	37	34	42
Kimhae	2	3	-1	6	-3
Cheju	-3	-9	-3	-4	-18
Remaining 11	-	-4	-9	-20	-6

Source: KAA.

5.77 The cost structure is, however, quite the reverse. For instance, Kimpo's share of overall expenses is a little more than 60%, Kimhae 13%, Cheju 12%, and the remaining 11 airports 15%. Thus, Kimpo--and periodically Kimhae--cross-subsidize the rest of the system (see Table 5-24). If interest payments for invested capital were included, all airports (with possible exception of Kimpo) would probably register substantial deficits.

Pricing Options for Domestic Airlines

5.78 As mentioned earlier, although domestic airfares are low, the prospects for raising them significantly are limited as long as the duopoly leader, KAL, does not raise them and risk losing market share. However, KAA knows that airlines do not make profits on domestic routes, and thus feels obliged to keep airport charges for domestic flights low. It fears that raising them would increase AAR's financial losses, which would result in the gradual loss of its market share to KAL.

5.79 A question of interest is, if KAA activities are corporatized and air travel costs are allowed to rise, how will this affect the two domestic airlines? At present, as the airport user charges are low, airport domestic operations are in the red and under competitive pressure from low railway and bus fares. But domestic airline operations could be profitable, provided MFE encouraged a simultaneous change to cost-oriented fares on all competing inter-urban modes of travel.

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[2] The reasons are: (a) Kimpo has large passenger and cargo volumes, and (b) more importantly, airport user charges for international traffic are about six to seven times of those for domestic traffic.

Pricing Options for Aviation Infrastructure

5.80 Aviation is one of the fastest growing sectors in the Korean economy. The need for additional capacity is pressing in the Seoul Metropolitan area (see Chapter II), where a new major airport is planned. The traffic forecast for the area is summarized in Table 5-25.

Table 5-25: Traffic Forecasts for Seoul Area Airports With the New High Speed Railway Between Seoul and Pusan (1992-2010)

Indicator	1992	1995	1999	2000	2005	2010
Passenger ('000)						
International	9,800	13,098	18,718	20,466	27,103	38,747
Domestic	11,431	15,815	21,753	23,558	25,363	31,603
Freight ('000ton)						
International	807	1,146	1,670	1,835	2,443	3,167
Domestic	164	256	354	384	413	516
Aircraft movements						
'000/year	145.7	178.3	242.4	278.0	352.3	476.1
Nos/day	399.0	489.0	664.0	762.0	965.0	1,304

Source: KAA.

5.81 After the opening of the New Seoul Metropolitan Airport (NSMA) at the end of the century, Kimpo's role in international traffic is expected to decline in absolute as well as relative terms, but the growing volume of domestic traffic may more than make up for this loss of volume. Kimpo is forecast to handle more than 90% of all domestic scheduled air traffic in 2010 for the Seoul area. Given the strong future market of aviation, a market-oriented pricing policy could generate substantial revenues for required airport investments.

5.82 Air travel may well remain more expensive than railway or bus travel by an amount equal to the value of the time savings, corrected for whatever comfort and convenience differences the traveller is prepared to pay for. Thus, there may be some scope to raise the pricing differential between air and railroad and both would probably have to be raised quite significantly. Inter-city travel in Korea is very inexpensive by international standards and the quality of service is as high as anywhere in the industrialized world.

5.83 User charges at Korean airports are based more on ability to pay than on actual costs. There is substantial price discrimination between aircraft and between different categories of services and passengers. However, the charges--except for some land rents--are uniform across all airports and they are insensitive to relative scarcities and differences in costs. KAA produces operating surpluses to a large extent from the operation of Kimpo despite the low (by international comparison)

user charges on aircraft and passengers.[3] An increase of user charges to international levels could increase the KAA gross revenue by 30%, or W60 billion.

5.84 Virtually all domestic airports are subsidized with the surplus derived from Kimpo. Thus, a case can be made to reform various airport user charges towards the opportunity costs of the services provided, i.e., apply differential user charges across airports. In fact, if domestic passenger taxes were doubled, operating deficits on the 12 loss-making airports would be reduced quite substantially, and the loss could be eliminated altogether if it were to go up another 20% to W2,400 per person.

5.85 There is potential to raise the discriminatory charges on international flights and passenger departure taxes. These are captive users, and face no other travel alternatives except to forego the trip or chose another destination than Korea. This is unlikely to happen, since an increase of these charges and taxes to average international levels would still be only a small fraction of the total air ticket cost. A 50% increase in the international departure tax would equate to international levels. Assuming an inelastic travel demand with respect to this increase, the incremental revenue would be about the total 1993 landing fee revenue of the 11 regional domestic Korean airports. A 30% increase in the landing fees for international flights would equal the international average, and yield the same increase in KAA annual revenue.

5.86 **Peak Period Pricing.** While congestion has not yet been much of a problem in Korean airports, traffic volumes are approaching capacity limits (see Chapter II). The rapid growth of demand will inevitably result in delays and losses unless capacity is expanded and/or demand curtailed. However, user charges at Korean airports are not being set with demand management in mind (basing them on peak periods). Instead, the KAA's typical response to congestion is to invest in expanding capacity.[4]

5.87 There appear to be two reasons for MOCT's inaction with peak period pricing. First, since general aviation plays an insignificant role in Korea as compared to other advanced countries, user charges would have to be raised substantially in order to have a significant effect on reducing traffic and/or diverting commercial traffic to off-peak periods. Therefore, it is believed that demand for airport services is insensitive to the range of price increases considered realistic. Second, the two national airlines (KAL and AAR) are the major users of airport services during peak periods, while foreign airlines use the airport mainly in off-peak hours. However, MOCT and KAA have yet to appreciate that a small reduction in peak demand, say 5%, could reduce congestion costs drastically because of the stochastic nature of queuing phenomena.

5.88 Thus, although overall demand for aircraft movement may not be sensitive to high user charges during the peak period, peak period pricing could still benefit the airports and the society by allocating the scarce capacity to high value users during peak times. This also benefits off-peak users by charging them less than the rates that would prevail in the absence of peak period

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[3] KAA is likely to show a net deficit if the opportunity cost of capital tied in the fixed assets are added to the cost and depreciation on the capital assets invested by the government are accounted for.

[4] Korea has successfully introduced the peak load pricing concept for electric power. This practice has raised utility revenues significantly, and at the same time helped improve utility operations and efficiency to such an extent that significant investments in power generation have been saved. Similarly, in the telecom sector Korea has recently started to apply peak/off-peak price differentiation.

pricing. At present, charter and general aviation are insignificant, but as these activities grow, the need for peak period pricing will increase.

5.89 **Other Issues.** Two additional issues involve terminal investments and operations, and the negotiated terms on which such terminal services are rendered to the airlines using them. These practices hide the true cost of services rendered and the nature of any subsidies offered. For example, the Government recently allowed the private sector to participate in airport financing on a somewhat ad hoc basis. KAL paid for construction of the second Kimpo passenger terminal, and then transferred its ownership to KAA in return for free use of the terminal for 20 years. KAA bears all maintenance and operating costs, and other airlines are allowed to use the facility by paying user fees (to KAA). Moreover, KAL is compensated by KAA for allowing other airlines to use the terminal. The other case is the new freight terminal at Kimpo. It was built and is owned by MOCT, but KAA maintains and operates it for U.S. airlines in return for Korean landing rights in the U.S.

5.90 In some countries, concession fees for refuelling rights are an important source of revenue for the airport authority or the national airline. In Korea, four private companies have such a license. The KAL subsidiary Air Korea dominates this market segment, and its revenue from fuelling is about US$50 million. This accounts for only 1.7% of KAL's annual gross revenue. The scope for raising significant financing resources by levying a rent on such concessions seems rather limited.

C. Pricing Policies for Korean Ports

Pricing Policies and Practices

5.91 As with other modes, Korean port prices have been heavily influenced by national price stabilization policies administered by the MFE. Since the early 1980s, port charges for vessels were frozen, but were raised by 5% in early 1994. The charges are highest in Pusan and Inchon, and somewhat lower in other ports. In general, they are low and not structured around port costs. Cargo handling charges (stevedorage and longshoring) have been regulated more in line with the Korean consumer price index, and increased 50%-90% from 1985-93. User charges on vessels as well as on cargo have evolved from historical incidents. Detailed regulation and ability to pay have clearly dominated over service cost-oriented pricing.

5.92 MOCT does not invest in the ports sector. Instead, KMPA, which was established as an independent Government office in 1977, is responsible for overall planning, investments, construction, and operation of all ports through 10 district maritime and port authorities (DMPAs). This is unlike the airport sector, where KAA just recently assumed an increasing investment responsibility from MOCT. KMPA does not record capital costs related to investments in the ports' income and expense accounts. This suggests little linkage between recurrent and capital costs and their recovery by means of various user charges.

5.93 **Port User Charges.** Port user charges are structured around dues and charges on the vessels (anchorage, dockage, mooring and tuggage), and cargo (wharfage, stevedorage, longshoring and storage fees).

5.94 Port charges vary substantially worldwide. In Korea, the price structure--which is uniform in all ports--imposes relatively high charges on vessels compared to those in other Far East countries (Japan and Taiwan), whereas cargo charges are low compared to those of Japan, but comparable to those of Taiwan.

5.95 Tugs fees in Korea are less than elsewhere: They are calculated according to horsepower while ports in many countries charge according to the gross tonnage of the vessels, which turns out to be very expensive for the larger ones.

5.96 With regard to cargo charges, wharfage is levied in a discriminatory manner. For example, it is 70% higher for general cargo that is inbound than outbound, while for mechanically handled cargo, it is the same for inbound and outbound. In addition, fees for 40' containers are twice that of 20' containers. General cargo wharfage is highest in Pusan and Inchon, and substantially lower in other Korean ports. It is very high compared to Kobe, comparable to the rate in Kaohsiumg, and considerably lower than in most western ports. Container wharfage is uniform throughout the country.

5.97 Compared to western ports, Korean tariffs may be on the low side for break-bulk, but on the high side for palletized cargo and ro-ro cargoes from specialized vessels. Container handling tariffs compare well with the bigger ports in developing countries. The costs of stuffing/unstuffing containers amount to US$1/ton which might easily be 20 times higher in many European and US ports.

5.98 The other main port charge is for cargo handling and storage. It is interesting to note that Japanese ports (Kobe) try to be attractive (particularly big ones even if they carry little cargo) by keeping port charges and wharfage charges low to compensate for high cargo handling (stevedorage and longshoring). However, cargo handling charges in Kaohsuing are in line with Korean levels. Thus, the high port dues, anchorage, and mooring charges in Korea relative to those in neighboring countries impose high initial costs for vessels calling with small cargoes.

5.99 Korean port dues, anchorage, dockage, and wharfage remained unchanged in nominal terms from 1983-93. Although port dues, anchorage and dockage fees were raised moderately in 1994 (around 5%), the real level of charges has fallen substantially below 1983 levels. Wharfage fees still remain the same. It is doubtful that Korean port productivity has offset inflation. The constant nominal port charges indicate a lack of association between the real costs of services and prices charged.

5.100 The structure of Korean cargo handling charges and tariffs is arbitrary, and typical of what is found in ports all over the world. Few attempts have been made to structure the tariffs to enhance productivity and cost effectiveness, as illustrated below:

(a) Demurrage is charged after five days for imports and seven days for export cargo. Transshipment cargo is charged after 10 days, and coal and grain after 15 days. For congested ports, the current practice works against the principle of congestion pricing. Instead, demurrage should begin immediately in order to expedite and encourage shippers to choose vessels that can be loaded and unloaded quickly, and spend a minimum time in port.

(b) Stevedoring and longshoring operations do not encourage cost effectiveness. For instance, palletized and pre-slung cargoes are charged about the same rate as break-bulk cargoes.

(c) Container handling charges do not reflect service costs. There is no cost-based reason why 40 foot boxes should be charged 180% of 20 foot boxes, or why empty containers are charged only 50% of the basic rate.

(d) As most port authorities find that direct loading/discharging from/to trucks hampers port productivity, the discount (about 50%) on such operations should be eliminated and possibly a premium should be charged.

(e) The tariff difference between ro-ro and lo-lo handling is too small to reflect the real cost differences, and to encourage lo-lo operations. Considering the cost of operations, a self-drive unit from a ro-ro vessel should pay less for stevedoring compared to lo-lo units using costly gantry cranes.

(f) The current stevedoring tariff assumes that revenue ton should reflect weight or measurement, whichever produces higher revenue except for break-bulk cargo, which is based on weight ton. However, in the case of revenue ton-based measurement, the basic rate drops by about 11.7%.[5] This practice offers a bonus to light break-bulk cargoes, and consequently a penalty for palletized light cargoes which are cheaper to handle.

5.101 In the case of over-storage, the charge structure is progressive and thus cost-effective. Most modern operators move their cargo within the limits of their allotted free time and avoid the over-storage charges. Such thinking should be applied to other port charges. A comparison of storage fees for imported cargo in KMPA's on-dock storage and Korea Customs Association's off-dock storage in Inchon illustrates this point further. KMPA storage fees are historically determined, whereas private operators' off-dock storage fees are set to attain cost recovery (see Table 5-26).

Table 5-26: Comparison of Storage Fees in KMPA's On-Dock Facility and a Private Off-Dock Facility at Inchon Port (March 1994)
(Won per 10 ton in weight and 10,000,000 Won in value)

Classification	On-dock Storage (A)	Off-Dock Bonded Storage (B)	(A/B) Ratio
1 day	7,400	10,000	74.0%
10 days	10,080	28,800	35.0%
30 days	34,200	74,800	45.7%
60 days	71,945	125,800	57.2%
90 days	108,665	239,800	45.3%
120 days	149,297	326,800	45.7%

Source: KMPA, Korea Customs Association.

[5] KMPA: *Port Dues and Charges Applicable at Korean Ports*, Part II Stevedorage, Section 4, Application Standards, note 9 (2), page 26.

5.102 Thus, it appears the present port charge structure offers limited incentive for efficient operations--both with regard to charges levied on vessels, as well as for cargo handling (for example, by stevedoring companies). The Japanese and Taiwanese decisions to eliminate or reduce GRT-based tariffs on vessels, and focus more on the cargo (at least in Japan) could reflect a move to more cost-oriented tariffs, provided the cargo tariffs include the costs of alternative handling methods (see Table 5-27 for comparative port tariffs in three countries).

5.103 In summary, a restructuring of port tariffs to remedy the current shortcomings could greatly improve port utilization and attract more modern tonnage. A cost-based tariff would reduce the costs of cargoes that could be handled by mechanized means and also speed up the turnaround of vessels in port. It would also increase the cargo-based revenues such as wharfage.

Options for Port Services Pricing

5.104 As mentioned earlier, the present system of port charges offers few incentives to use facilities more efficiently. For example, ship dues are charged at a daily rate, even for ferries staying just a few hours. Similarly, cargo dues are the same for those staying less than the number of days granted for free storage. The discrimination against ro-ro vessels where the stevedoring costs are practically nil, is another example where quick turn-around is not rewarded. And finally, container handling fees are based on container size rather than the cost of lifting the boxes.

Table 5-27: Port Tariffs in Korea, Japan and Taiwan (1992)

Item	Unit	Korea Pusan	Japan Kobe	Taiwan Kaohsiug
Vessel Dues:				
Port dues	Won/GRT	113	17.5	0
Anchorage	"	15.8	0	0
Dockage	"	31	82.7	21.6
Mooring due	"	24	14.9	5.2
Cargo dues:				
Wharfage	Won/ton	293	82.7	247.5
stevedorage (palletized)	"	1,127	8,578	1,075
Longshoring	"	1,388	12,884	861
Stevedorage:				
20'	won	56,383	240,848	59,625
40'	won	80,574	350,324	78,079

Source: Korean Foreign Trade Association.

5.105 A preferred approach would be if joint fees were charged for both cargo and vessel (for the use of the port facilities)--quay front plus the square meters of port area (covered or open)--for whatever cranes and/or forklift trucks are needed, and for the time the various facilities are occupied.

5.106 Such a practice would be easy to introduce for operators with their own terminals. The trend towards the use of private operators to develop port facilities in Korea would definitely promote this system. For common user berths, a fair solution is difficult to establish, but the existing system based on ship volume, works against efficiency.

5.107 When restructuring port charges, authorities will need to reflect congestion. Also, the Japanese and Taiwanese systems of exempting vessel dues or levying low rates may be better than the present Korean high-volume-based vessel charges. The relative scarcity of input factors (storage and vessel/cargo handling capacity, for example) in the overall port supply should also be reflected. Given the long wait times and congestion, it would be rational to encourage the use of quick turn-around vessels such as ro-ro.

5.108 In order to optimize inter-city freight transport distribution, coastal transport may play a larger role. Roads and railways are already severely congested, and additional right-of-way capacity can only be built at a very high cost. Conversely, coastal shipping can be expanded at moderate costs. In fact, this process could be accelerated if GRT-based port charges were discarded and cost-oriented tariffs (included substantially reduced stevedoring charges for ro-ro vessels) were introduced.

Regulatory Practices, Policy Constraints and Coordination Across Modes

5.109 The structure of prices in the transport sector in Korea varies considerably from one sector to another, governed largely by the objectives of stabilizing prices, and contributing to development objectives and social programs. For example, subsidies to KNR are mainly directed to providing low cost fares for third and fourth class service for lower income populations with few alternatives. Conversely, controls over prices in privately-owned interstate trucking are largely directed toward the objective of stabilization through control of entry/access and pricing through the medium of regulation. While well-intentioned, these controlling policies lead to price structures distorted from costs which, in turn, cause further distortions and misallocate resources.

5.110 It is evident that for most of the infrastructure and service providers in the transport sector, prices have not been linked to economic objectives. For example, gasoline is relatively inexpensive, and coupled with an easing of constraints on automobile ownership, the level of ownership has increased dramatically, as has private car traffic on inter-urban and urban roadways. According to KOTI, the real prices of gasoline and diesel (considering the rate of inflation) were less than half the levels of the 1980s. Similar low levels were reported for toll rates, and taken together, it is safe to assume that low prices are contributing to congestion on major inter-provincial expressways and in urban areas.

5.111 Given the congestion conditions in the major corridors of road, rail and air, provision of new capacity may be necessary. However, the use of pricing as a means of controlling the congestion would represent a major step in the direction of assuring more efficient use of the present transport resources, especially if linked to a more open market pattern of price setting and significantly reduced regulations on entry. In addition, a more efficient tax relationship between gasoline and diesel as well as among vehicle sizes would help restore a more appropriate balance between the use of gasoline and diesel fuels and the size and type of vehicles on the road.

5.112 Improved inter-modal efficiency is recognized as an urgent priority for the country. This will most likely to be achieved through competition and market-based coordination among the modes, each developing its most economically competitive market strategy and share. Under current conditions, transport public infrastructure operators (i.e. airports, rail etc.) and transport service suppliers (i.e. inter-city trucking, buses and aviation modes) whether public or private are all under the close Government surveillance. At the point where price increases are required, each mode must submit its costs to the appropriate ministry or division but final approval is given by the MFE.

5.113 MFE's role reflects a government policy of assuring price stability while assuming that this also assures rapid and consistent economic growth. But inefficient transport pricing is not consistent with maximizing economic growth. Pursuing price stability by preventing needed price adjustments in the face of changing cost and market conditions will reduce growth, not increase it.

D. Summary of Specific Conclusions and Recommendations

Inter-City Land Transport

5.114 **Inter-City Road and Rail Transport.** These two modes provide the basic services for both freight and passengers in Korea, and improvements in efficiency and increased productivity through more competitive operating conditions and market-based pricing could contribute greatly to Korea's economic goals.

5.115 **Inter-City Buses.** Currently, inter-city buses operate under a complex regulatory process governing entry, operations and fares. This process separates the market forces of competition, fares, service and the available service capacity as required and measured by market-related pricing under a regulated environment. The Government is not allowing any new bus service to be introduced, and where routes overlap, bus operators coordinate through mutual agreement, reflecting the potential for non-competitive (protected) conditions.

5.116 Inter-city bus fares are set through a complicated process with fares ultimately approved by MFE based on an elaborate brief prepared by the bus operators' trade association. Although bus fares and increases appear to be cost-related, there are clear indications that greater efficiency could be achieved through a simpler and more market-oriented approach regarding fares, routes and service.

5.117 **Inter-City Truck Transport.** As with inter-city buses, the trucking industry is characterized by a complex regulatory process designed to cover and control all aspects of operations and service from entry and route assignment and approval to fleet characteristics. Truck tariffs appear to be based on the average operating cost of national operators but many truckers charge higher rates where market or commodities permit, and lower rates if an empty return is involved. The latter deviations more closely reflect market pricing although they are not permitted under current regulations. The present tariff policy based on an average cost should differentiate between commodities and the other operating conditions that affect costs.

5.118 Since no new (or a very limited number of) truck operating licenses are being authorized, a significant volume of "illegal" truckers are in the market, linked to commercial companies. In this context, cross-subsidies occur between private "illegal" operators and other types of trucking operations.

5.119 The restrictions on regulated trucking foster reliance on privately owned and operated vehicles, which typically have poorer utilization than could be achieved in a competitive trucking market. The dominance of non-commercial trucking is testimony to the inefficiencies resulting from excessive regulation of commercial trucking. As with buses, a shift toward more market-oriented policies would contribute significantly to greater productivity and efficiency in the Korean trucking industry.

5.120 **Inter-City Rail Transport.** KNR's tariffs and operating practices are presently controlled by the Government's regulatory process. However, with KNR's corporatization set for January 1996, many restrictions will be dropped and a more independent and market-oriented decision process will be possible. If the corporatized KNR is operated in a business-like way by a top management team, it will place greater emphasis on market-based tariffs and competitive marketing responses, and make its operation more efficient.

5.121 A more effective marketing program is needed, especially to compete with the trucking industry. This is especially true for container movements where rail has the potential to be more competitive than at present. However, this will require improved marketing and a corresponding tariff rate structure as well as investment in modern container cars.

5.122 The present government policy of subsidizing third and fourth class rail passenger tickets raises the issue of the PSO concept to KNR and elsewhere in the transport sector. It highlights the use of the subsidy, making it visible to the public and it can be regularly reviewed for relevance to on-going policy. The concept also has the advantage of allowing transport costs to be segregated from those that are not transport oriented, where subsidies are involved. The PSO should be evaluated and an implementation plan for its application to KNR and other transport sectors developed.

5.123 The HSR project is moving ahead, and with recent agreement about the manufacture of vehicles/train sets, progress is likely to continue. However, a key issue is financing. Also important are pricing policies on HSR and competitive modes which will affect project financing. Predictions of traffic diverted to HSR are very high; and, if the amount of the diversion is less than forecast, this will add to the project's financial burden. But it is also important that each mode of transport be priced efficiently in relation to the competing modes.

5.124 **Highway Infrastructure.** Given current congestion levels on inter-city expressways, toll rates need to be raised to more closely reflect full economic and social costs. The use of differential toll rates designed to reflect distance, congestion and highway wear would contribute greatly to a more efficient use of capacity. In this context, three criteria should be considered in the toll pricing process: (a) policy should be consistent regarding the structure and updating of toll rates; (b) a separate policy should be created for urban and inter-urban highways; and (c) on urban expressways, differential rates should be based on the traffic peak characteristics of each highway network.

5.125 Under present tax policy, gasoline and diesel taxes are distorted due to the relatively low tax on diesel. Vehicle investment may be distorted with diesel vehicles being purchased and used where they are not appropriate. In order to avoid these inefficiencies, diesel and gasoline taxes need to be equalized. More generally, the relationship between fuel and other taxes and road damage and environmental costs need to be investigated. As described in Box 5.1, the New Zealand

structure of road user charges may serve as a useful guide for basing road user charges on the costs of accommodating different vehicle types.

Air Transport

5.126 As in other modes, air travel and related airport use are growing rapidly. Major airport investments are underway for Seoul; no expansion plans have been announced for Cheju, but it too is congested.

5.127 The airline industry is essentially private and will see to its own investments. However, domestic air fare increases have been restricted by MFE policies. Lower air fares stimulate air traffic at the same time as they produce less revenue for the airlines (air business travel is price inelastic). The stimulation of air travel is at least partly offset by similar underpricing of land transport modes due to the same MFE policies. The net result is higher traffic and congestion and lower revenues in all the modes. Thus, price controls need to be relaxed and the air market should become more competitive.

5.128 Airport investments are officially determined, albeit in a Government corporation. Although an array of airport user charges exist, the resulting cash flow is well below full cost recovery (full recovery is not necessarily an optimal policy for airports). Where capacity is unutilized, it is appropriate to limit prices to encourage use, although traffic should more than cover identifiable marginal costs. Where airports are congested, charges should reflect the costs of different services provided, differentiating by time of day (peak hour surcharges). The present airport price structure needs to be reviewed and overhauled both to allow different charges for different services at different airports, and to increase the level of charges where costs are high and/or congestion need to be rationed. Such a pricing framework will not only lead to more efficient use of airport facilities, but it will generate additional revenues to help finance planned infrastructure expansions.

5.129 The Government should carefully review the roles for the two Seoul airports in the future. Dividing services between them may be inefficient. It might be possible to find alternate uses for some of the land and facilities of the Kimpo Airport once the new airport is fully operating. No recommendations are made here except to draw attention to the importance of finding the best use of these valuable lands and facilities.

5.130 In financing airport expansion, it will be possible to foster private sector participation with some of the infrastructure, such as terminals or other user facilities. It is important however, to ensure provisions are made for access to facilities by other users; otherwise, control over important components could be used to thwart competitors.

Ports

5.131 User charges are imposed for various services provided in Korean ports. But the charges are not linked to costs, nor are they designed for effective demand management. There is an opportunity and need to redesign them, to allow different charges for different services provided at different time periods and different ports. It is also important to properly record and account for all capital investments in ports, whether funded by port corporations or Government. Given the high levels of congestion, an economically-based pricing system would generate additional revenue to finance needed port investments.

5.132 Greater autonomy for individual ports (such as regional port authorities) would facilitate greater operating and cost responsibility. The formation of KCTA appears to be a step in this direction. New laws which allow greater private participation in providing port facilities will also contribute toward reorganizing and rethinking port pricing. Greater private participation may also help foster better inter-modal links between land and ocean transport.

VI. MOBILIZING FINANCIAL RESOURCES

6.1 This chapter outlines both strategies and specific steps which can be taken to mobilize financial resources for the Korean transport sector. The first section summarizes the primary strategies which can be followed to mobilize resources to bridge the financing gap identified in Chapter III. This includes attracting greater private sector participation in supplying infrastructure. The next two sections focus on specific resource mobilization options in the urban and interurban sectors.

A. Strategies for Bridging the Financing Gap

6.2 Chapter III reviewed the transport investment expenditures projected by the Government for the current planning period (1993-1997). One option to close the anticipated financial gap is to scale back some of the planned transport expenditures. This phenomenon is already occurring, as the KAA is extending the completion date for Seoul's new airport.

6.3 However, beyond these practical budgeting alternatives, five measures could enhance the Government's ability to mobilize additional resources for transport investment and help stimulate private sector involvement: (a) introducing more market-oriented pricing; (b) attracting private sector financial participation; (c) finding ways to use existing assets to generate cash flow and reduce costs; (d) broadening the range of mechanisms for conveying Government financial support; and (e) continuing to liberalize financial markets. These themes will be discussed in general terms, with international examples.

Market-Oriented Pricing

6.4 To attract greater private participation (para. 6.8), pricing structures must reflect cost and market conditions. Chapters IV and V reviewed existing pricing and regulatory policies and recommended changes to encourage more efficient utilization of urban and inter-urban transport facilities. Price reform also is important for financing projects. In order for project-related debt to be issued and private equity attracted to SOC transport investment, individual projects must be able to generate revenues according to forecast market conditions. To attain revenue projections, the following principles should be considered:

- Establish prices in relation to market conditions, capital and operating costs;
- Use prices to help balance supply and demand, e.g., to ration congested facilities and steer traffic to under utilized capacity;
- Introduce periodic price changes in response to cost, demand and inflation experience; and
- Clearly identify revenues from user fees or subsidies from central and local government sources.

6.5 Discussions in Chapters IV and V noted that the Government often uses cross-subsidies to mitigate the impacts of its regulation of prices and service on carriers and operators of infrastructure. The extensive web of cross-subsidies may be producing distortions in demand which, in turn, could be affecting the need for additional transport infrastructure. The combination of cross-subsidy and regulation is producing high administrative costs and increasing the difficulty in making optimal capital allocation decisions.

6.6 As discussed earlier, an important example is the pricing of transport services between Seoul and Pusan, the nation's most heavily utilized and congested corridor. Domestic air and rail fares (first class) are less than one-third those of comparable service between New York and Washington, D.C., a somewhat shorter and less heavily-utilized route. This corridor also generates one-half of KHC's total revenues and has revenue per kilometer that is twice as high as the rest of KHC's toll roads. As a result of the low prices, cost recovery for KHC is less than 20% the level required to build and operate new and expanded facilities along the congested portions. (Cost recovery is less than 10% on other routes).

6.7 Market-driven pricing and peak-period pricing (time of day, seasonal, weekend/weekday) on the Seoul to Pusan corridor could not only generate substantial new revenues, but help distribute the demands among the modes to maximize the utilization of existing facilities at all times.

Private Sector Participation

6.8 A feature of Korea's current, five-year plan to expand social infrastructure investment is the Government's desire to attract private investment above and beyond central and local government commitments and internally-generated investment by public corporations. Although Korea has some experience with private involvement in infrastructure, it is still limited. At present, private participation is perceived as being oriented towards maximizing real estate development and attracting "equity" from builders and suppliers of social infrastructure projects. These perceptions may make it difficult to advance privatization efforts for several reasons. First, it reinforces the view that real estate gains can cross-subsidize transport losses or low returns on investment resulting from price regulation. The reality is that real estate can play a substantial, but not necessarily central role in transport finance. For example, if the Seoul Development Corporation is generating revenues approximating 5% of annual capital outlays in the most highly valued real estate markets, even doubling or tripling this level would not generate sufficient resources to justify continuing price regulation. Pricing freedom will yield more long-term benefits through new private investment, greater efficiency in resource allocation and demand management than potential subsidies from land development.

6.9 Second, there is likely to be greater resistance to privatization efforts if the perception exists that the primary motivations of the private sector bidders are to strip-away the real estate assets and/or secure valuable supply contracts on a preferential basis. Linking the financial success of the project to the transport-related revenue streams available is the best approach to attracting committed, long-term investors whose primary goal is quality transport service. Achieving this goal will require greater reliance on market mechanisms for pricing and service decisions.

6.10 Third, the promise of implicit Government guarantees for enterprises whose economic fundamentals may not pass international investment banking standards as a result of price regulation

would raise the specter of an increased concentration of economic activity in the "chaebols." Thus, transparent relations between Government and transport enterprises are important for attracting private sector participation.

6.11 Therefore, it is important that the Government assume a broader perspective on the role which private firms can play in financing and delivering transport infrastructure projects. This continuum is explored in *Institutional Options for Provision of Infrastructure* (World Bank, discussion paper #212). Examples which may be relevant in the Korean context include:

- **Turnkey Contracts:** Major construction projects can be bid on a turnkey basis which effectively transfer many of the risks of cost overruns and delays to the private sector. Box 6.1 summarizes variations of the "build-own-transfer" (BOT) approach. The projects may be broken into major elements or, in some cases, bid as a single undertaking depending upon the scale and complexity. This approach can insulate the public sector, at some additional cost, from delay and cost escalation. While not necessarily yielding "new" revenues, the risk sharing can be translated into real value. The "system" contract recently signed by the Government for the HSR project is an important example.

- **Leases and Concessions:** As Korean experience amply demonstrates, it is possible to derive considerable value from public real estate assets through leasing without necessarily privatizing the entire transport venture. Similarly, the ability to grant franchises and concessions for new or existing facilities represents an option for unlocking the value held in existing assets, as well as capitalizing future revenue streams from new facilities. For example, auto parking at Kimpo Airport generates approximately W13 billion per year in revenues. If pricing was de-regulated, a concession could be granted under which a private operator would guarantee a minimum rent stream to KAA, as well as a share of profits above an established threshold. This is similar to the privatization strategy being pursued by KMPA and KCTA and could yield increased managerial efficiency and cost savings, along with higher revenues from better market-based decision making.

- **Out-Sourcing and Management Contracts:** Turning over public enterprises to private firms under management contracts with incentives for performance, cost savings and new revenues would permit a strong, but transparent public sector role in activities where pricing subsidies are inevitable or the result of explicit policy decisions. Even in instances where public sector operation is maintained, it is possible for specific functional areas (such as computer services, property management, equipment overhauls, or maintenance and construction services) to be bid competitively. These alternatives would permit in-house forces to "bid" for work and create competitive pressures for improving quality and reducing costs.

6.12 Box 6.2 summarizes the feasibility of private sector delivery of infrastructure components based on World Bank experience in other countries.

6.13 In order to bring about increased private participation and finance, a draft legislative framework for expanding private sector participation was recently passed. It includes some of the following elements:

Box 6.1: Variations of the BOT Approach:

There are various arrangements to attract private investors to build public infrastructure. They differ in financing arrangements and risk-sharing. Known as BOT, the basic idea is that investors finance and Build the facility, Operate it for a period collecting fees or dedicated tax revenues, and the Transfer ownership to the government at the end of the period.

BOO: Build-Own-Operate:
the investor retains ownership, operating in perpetuity via an open ended franchise;

DBOT: Design-Build-Operate-Transfer:
same as above plus design

BOOS: Build-Own-Operate-Sell:
at the end of the franchise period the state pays the investor a residual value;

BOOT: Build-Own-Operate-Transfer:
as above, but there is no terminal payment to the investor;

BOT: Build-Operate-Transfer:
the facility is paid for by the investor but is owned by the concedant; the concessionaire maintains the facility and operates it during the concession period;

BOTT: Build-Operate-Training-Transfer:
before facilities are transferred, the investor is required to provide training; and

BTO: Build-Transfer-Operate
a variation on BOT where the ownership is transferred to the government immediately but the builder has an exclusive franchise to operate it for a specified period (ownership liabilities are borne by government rather than the builder).

Source: Based on *Private Financing of Urban Transport Infrastructure in Asia*, Shunso Tsukada and Roger Allport, ASTIN, 1991.

- Simplified and expedited project approval process under a "lead" ministry, with coordination of approvals through an Economic Planning Board steering committee. Once approved, Government's ability to impose changes would be limited and compensation of the "project implementor" would be required.

- Broadened rights for private entities to acquire and sell land, receive exemptions from real estate taxes imposed on land transfers involving sites previously designated for agricultural or forest uses; utilize Government-owned properties; conduct for-profit "attached development" activities on project-related real estate; and use Government-owned facilities without charge during construction.

- Priority in accessing foreign credit.

- Ability to act as a unit of local government in carrying out housing-related projects.

Box 6.2: Feasibility of Private Sector Delivery of Infrastructure Components:

Key to marketability ratings ☐ = 1.0 (least marketable) ☐ = 2.0 ☐ = 3.0 (most marketable)	Potential for competition[a]	Characteristics of good or service	Potential for cost recovery from user charges	Public service obligations (equity concerns)	Environmental externalities	Market-ability index[b]
Railbed and stations	Low	Club	High	Medium	Medium	2.0
Rail freight and passenger services	High	Private	High	Medium	Medium	2.6
Urban bus	High	Private	High	Many	Medium	2.4
Urban rail	High	Private	Medium	Medium	Medium	2.4
Rural roads	Low	Public	Low	Many	High	1.0
Primary and secondary roads	Medium	Club	Medium	Few	Low	2.4
Urban roads	Low	Common property	Medium	Few	Few	1.8
Port and airport facilities	Low	Club	High	Few	High	2.0
Port and airport services[c]	High	Private	High	Few	High	2.6

Source: World Development Report 1994, World Bank.

[a] Due to either absence of scale economies or sunk costs, or existence of service substitutes.

[b] Marketability index is average of ratings across each row.

[c] Including cargo handling, shipping and airlines.

- Authority to establish joint ventures with public entities, with the public sector partner holding less than 50% of the ownership, having no voting rights and able to forgo a participation in profits.

- Right to operate infrastructure facilities whose title has been transferred to the Government; set tariffs and collect charges subject to "consultation" with the Government if prices negatively impact the public interest; and receive exemptions from anti-monopoly and fair trade laws.

- Establish an infrastructure fund to guarantee the credit of private project implementors. The fund would be capitalized from public sources and could be used to provide guarantees of up to 15 times the level of contributed capital for debt service, as well as operating and maintenance expenses.

- Authority to accept loans and subsidies from Government agencies and receive tax reductions and exemptions.

6.14 A preliminary review of the legislation suggests that a thoughtful, workable framework for private sector participation in infrastructure development can emerge. Many specific

measures are left open to negotiation among the parties, which is appropriate and typically a key feature of successful public/private partnerships. The loan guarantee fund will facilitate private capital investment and help mitigate political risks arising from adverse Government involvement in future pricing decisions.

6.15 Several important issues remain open. Perhaps most significant is pricing. In order to attract private participation, prices will have to become market-driven and subsidies made more explicit. Continued regulatory intervention will result in excessive political risk, the potential for even more complex cross-subsidy arrangements and/or use of the proposed loan guarantee fund as a mechanism for delivering subsidies to private enterprise (to either the "project implementor" or the financial institutions at risk).

6.16 As a corollary consideration, a realistic assessment of the net gain to the Government in additional resource generation and efficiency must be undertaken. For example, if greater pricing flexibility is provided under privatization proposals, perhaps similar gains could be realized by granting pricing flexibility to public corporations, which generally appear to be efficiently managed in Korea. A similar concern would affect granting private "project implementors" greater access to lower-cost, foreign capital than public corporations and other Government agencies. Gains from "managerial efficiency" therefore should be evaluated on a case-by-case basis.

6.17 A related issue involves utilizing private "project implementors" to tap real estate value for transport investment. Cross-subsidization of capital improvements with real estate profit appears to be a major goal of the proposed structure for private sector involvement. A wide variety of taxation and development schemes to re-direct increments in property value arising from changes in land use and accessibility are presently part of the national and local government transport financing structure (discussed further in the urban section of this chapter). The "additionality" from privatization of the associated transport activity remains to be determined. Further, there may be downstream risk in attracting private "project implementors" whose primary interest is in real estate development, rather than the underlying transportation venture.

6.18 The project selection process in the current privatization structure appears ambiguous. It is unclear if very large projects, such as NSMA or high speed rail, would realistically lend themselves to privatization schemes. These "mega-projects" involve huge amounts of capital and high construction risks. However, it is possible to stratify individual projects into components which isolate risks and revenue generation potential in order to attract private investors. At this time, it is also uncertain as to whether the Government would identify priority projects for which it issues tenders for private capital, or whether private entities will be expected to come forward with their own project proposals based upon informal consultation with the affected ministries. The more transparent the project selection process and the closer public priorities and privatization proposals can be matched, the greater will be the benefits for Korea's transport sector.

6.19 Credit analysis capability for rating debt backed by project revenues established by market forces and purchase of services guarantees ("take or pay" contracts for example) will be important in allocating credit to the projects offering the highest returns. The allocation of domestic credit, or access to foreign debt to SOC projects would perpetuate policy lending and excessive reliance on signature credits.

6.20 Finally, it must be recognized that any SOC privatization structure (such as BOT, etc.) will necessitate more complete liberalization and development of capital markets. A yield curve which can price long-term debt competitively and provide risk/return trade-offs are important success factors. The current practice of financing long-term investment with short-term, signature credits is unlikely to help attract new private capital.

Utilizing Existing Assets

6.21 While considerable emphasis is being placed on private involvement in future SOC infrastructure, the most immediate and potentially attractive opportunities for the Government to generate new sources of capital may be through franchising, divesting, securitizing and re-financing existing assets. In order to realize the value in existing assets, pricing reforms are likely to be required and a certain amount of debt restructuring may be necessary.

6.22 Privatizing new facilities will yield lower levels of incremental private capital because of construction risks, uncertainties in projecting future demand and the fact that the most heavily-valued and utilized assets are those which already exist. Capitalizing the revenue streams of existing assets involves lower risk levels and permits lower capitalization factors to be applied in establishing values. The result will be more resources for investment attracted to the transport sector from the same revenue stream.

6.23 Examples may include: disposing of underutilized land held by public agencies and corporations, franchising existing toll roads, carrying out KMPA's program to lease its multi-purpose shipping berths, leasing KNR's existing and future rolling stock, franchising the operations and maintenance of existing subway lines, or converting Kimpo Airport to alternative uses when the NSMA is built.

6.24 Turning existing assets over to private management and operations would help increase operational and managerial efficiencies, and thus help control the growth of operating and capital costs. Private operation can also improve revenue streams from ancillary sources, such as retail concessions. In addition, up-front payments, guaranteed minimum annual rents, and participation in future revenue increments could attract capital for needed investment in new facilities and for expanding existing facilities, while minimizing risks for public agencies.

6.25 Strategies to securitize high value land assets now owned by Government and carry out "swaps" and "like-kind exchanges" with property owners affected by infrastructure investments could, in some cases, help moderate the cash outlays required for new facilities. Land acquisition has increased from 16% of highway project costs in 1985-87 to 63% from 1990-93 and is the main reason why increasing levels of public outlays for roads are yielding smaller and smaller increments of additional capacity. By listing existing Government real estate assets as a publicly-traded security, perhaps coupled with tax advantages on gains realized when "swaps" are accepted by property owners, liquidity could be provided that would make the "in-kind" payments more attractive.

6.26 It is also possible that the benefits from leaving pricing decisions to market forces could be realized more readily if a private franchisee or privatized public corporation were to operate the existing toll road, rail and subway facilities experiencing heavy congestion. Pricing decisions could become more of an economic, and less of a political concern under a private sector operating scenario.

6.27 Estimating the magnitude of potential contributions from tapping the value of existing assets depends on assumptions about future pricing flexibility and Government land use policies. For example, it has been postulated that if the existing Kimpo airport were sold for private development and the NSMA initial phase expanded to handle additional domestic service, the value recovered by the Government, as well as the avoided cost of W1 trillion required for access improvements between Kimpo and NSMA, could cover the cost of NSMA. However, the Government would have to resolve concerns that Kimpo exists in a "green-belt" area which is not designated for future development at this time.

6.28 Finally, the privatization of existing public assets could enhance efforts to liberalize the financial markets by providing important sources of debt and equity for which values can be established on a less speculative basis than for new facilities.

Broadening Government Support

6.29 At present, Government support for transport investment has been either direct grants or loans to municipalities and public corporations, or indirect cross-subsidies. In some cases, the loans may be on soft terms with maturity of 20 years, amortization over 15 years and below-market interest rates.

6.30 A wide variety of alternative approaches to explicitly injecting Government support are possible that would constitute conditional sovereign obligations (rather than full faith and credit commitments) and yield less distortion in pricing and project financing than cross-subsidies. These mechanisms include: public service obligation payments, service contracts, earmarked tax revenue bonds and leases.

6.31 Converting cross-subsidies into more explicit forms of Government contract payments would facilitate the transition to market pricing and provide a basis for financing future capital investments. For example, establishing a long-term contract between the Government and KNR to provide a certain volume of capacity for low-income passengers or bulk commodity shippers would permit the distorting effects of cross-subsidies to be removed from the railroad's financial projections. This would enhance the railroad's market value under a corporatization program, increasing the proceeds of stock issued by the Government. In addition, contract payments could be established as the revenue source for bond or preferred stock issues by KNR to raise additional long-term capital. These payments would be subject to annual appropriation and not considered full faith and credit obligations of the Government.

6.32 Similarly, re-financing KHC and subway-related debt with long-term bonds backed by reliable sources of revenue can be accomplished without encumbering the Government's sovereign credit. One approach could be to impose a surcharge on existing gasoline and diesel fuel taxes that would be earmarked for 15-30 years for debt service through a new category of "revenue bonds." The bonds would be backed solely by the surcharge revenues, not sovereign Government credit. The revenue bonds would be exchanged for the subway bonds coming due, short-term KHC borrowing, or other transport sector obligations. It is possible that such a strategy could clear the balance sheets of KHC, PUTA and the Seoul subway of short-term debt and debt which cannot be sustained from internally-generated revenues. Relieved of their over-hanging debt burden, these entities could apply a higher proportion of their capital funds to construction, rather than debt service, as well as become more attractive candidates for some form of franchise privatization.

6.33 The Government could use revenue bonds to re-finance the obligations now on the books of its public corporations without expanding its own deficits. Here again, "service contracts" and "revenue" bonds could help deepen Korea's capital markets by offering a range of new securities which are longer term and whose risks can be readily evaluated by the emerging pool of investors.

Continued Liberalization of Financial Markets.

6.34 Introducing the new financing tools noted above and attracting private capital to transport infrastructure will require continuing liberalization of the financial sector, as recommended in World Bank, 1993, Report No. 11373-KO and involves addressing the following concerns:

- Regulating interest rates
- Short term structure - 3 year bonds
- Sectoral policy loans
- Emphasizing guaranteed public and private debt
- Limiting foreign investment and Korean public and private entities raising funds abroad
- Limited capacity to rate debt
- Regulating the issuance of debt and equity, which are relatively high-cost funds

6.35 It is important that progress in liberalizing the financial markets not be impeded by the desire to attract private investment to SOC projects. Allocating domestic credit or providing SOC projects with access to foreign credit could result in continuing policy lending and an attendant increase in moral hazard risk.

6.36 On the other hand, deregulating interest rates and establishing a yield curve would permit transport investments to gain access to longer-term debt that is better matched to the stream of anticipated benefits they will yield. Rate fluctuations also would permit risks to be more closely analyzed and would produce a broader range of capitalization opportunities for "project finance" rather than guaranteed debt. The variation in credit risk would permit the types of off-balance sheet public financing described above to be domestically financed for both the Government and municipalities.

6.37 Introducing new financial instruments and facilitating the financial markets' capacity to provide them with liquidity would help deepen the local markets, while promoting private investment in one of the Government's highest priority sectors.[1] SOC-related financing mechanisms could include retail stock offerings, investment instruments specifically designed for attracting overseas capital that would reduce the need for sterilization of foreign investment flows, longer term investment tools targeted to the pension fund/insurance sector, domestic convertible debt to help mitigate ramp-up risk, preferred stock, and real estate investment trusts to securitize public property holdings. (See Box 6.3 on capital market development in Argentina).

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[1] For details concerning the desired sequencing of financial sector reforms in Korea, see World Bank (1993).

Box 6.3: Capital Market Development Project in Argentina:

This World Bank project aims to accelerate capital market development to help Argentina meet growing investment demand. Continued stability will improve the volume and terms of bonds and loans, but faster growth of long term finance is still inhibited. Reasons include (a) insufficient development of capital market regulation and supervision and (b) remaining fears of unpredictable reversals of the fundamentals supporting stability. The operation would not address all capital market issues. The objective is to encourage the holding of medium and long term securities by investors and bankers and longer term lending by prime-rated commercial banks. This objective would be achieved by improving market confidence and ensuring liquidity to creditworthy banks in the event of market developments that raise or cause spikes in domestic interest rates. The operation would assist small-and medium-size businesses, which traditionally have had little access to term lending from the banking system.

The project is designed to introduce and consolidate the necessary capital markets infrastructure which, along with developing indigenous skills, can produce a sustainable and orderly national market. This includes the development of standardized debt securities, which help meet the growing needs of issuers and investors for liquid trading markets, and the further development of existing national credit rating agencies that would enhance the market's ability to price and trade debt instruments with confidence. Furthermore, a proposed backstop facility (BF) is designed to inject confidence and provide leadership for the development of a longer term debenture market -- without detracting from the natural growth of local and related international markets and without masking the market's pricing signals. The BF's assurance of future liquidity will assist banks to issue debentures in local or international markets, and to offer loans with even longer maturities with the assurance that debentures can be sold in the future.

A loan from the World Bank will support a BF that will offer prime-rated commercial banks the option to sell to the facility US-dollar-denominated securities issued to refinance specifically identified US-dollar-denominated bank debentures that banks had issued to support their longer term loans, should banks be unable to rollover or extend such debentures in the market. This facility will be implemented through a corporation (the Fund) established and owned by the Government. The reforms supported by the 1991 Public Sector Reform Loan and the 1993 Financial Sector Adjustment Loan (FSAL) are expected to improve the banking policy framework for the project. An agreed policy and institutional development program including macroeconomic stability, freely determined interest rates, the removal of existing interest rate subsidies, and strengthened capital market regulation, supervision and enforcement, will help to increase market confidence. A complementary Capital Market Development Technical Assistance loan (CMTAL) is planned concurrently to help finance improvements in capital market supervision and regulation; to train commercial banks' staff in undertaking project financing; and implement the new, reformed pension system.

Source: Ongoing World Bank Project.

6.38 Foreign borrowing is also a source of capital. Improved Korean capital markets will reduce the need for foreign borrowing. However, foreign capital can play an important role in mobilizing financial resources for Korean infrastructure.

Summary of Gap-Filling Strategies.

6.39 In addition to the traditional budgeting approach of deferring investment plans, other options are available to fill potential gaps in transport investment. These options include: structural

adjustments in pricing, unlocking the value in existing assets, broadening the range of instruments used to convey Government financial support and continued liberalization of financial markets. Pricing liberalization remains key to attracting private investment in new or existing facilities. Until project risks and capitalization factors can be established on a market basis, the need for cross-subsidies and Government-backed credits will continue. And, to the extent that Government participation continues to be conveyed through such means as cross-subsidies, credit allocation and interest regulation (subway bonds are one example), private investment in transport infrastructure will remain nominal and dominated by the largest firms that are capable of securing indirect Government guarantees. Conversely, deregulation of pricing along with financial market reforms could open the door to a new era of private participation, as well as lead to more efficient use of existing capacity and optimal sharing of demand among various transport modes.

B. Applying the "Gap-Filling" Strategies in Urban Transportation

Resource Mobilization Practices in Urban Transportation

6.40 In recent years, responsibility for transport investment has been down-loaded from the Government to the municipalities and public corporations. Local government's share of transport investment grew from 31.5% in 1985 to 46.7% in 1991. It is expected to peak at 48.6% in 1993-94 and begin an annual decline to about 37% by 1997. Perhaps more revealing are the actual cash outlays these proportions represent. For example, 1985's local government outlays were W0.4 trillion, compared to W2.0 trillion in 1991. From 1993-97, when the municipal share (in %) of transport investment is projected to decline, the magnitude of overall expenditures in constant won would grow from about W3.0 trillion to W5.12 trillion.

Municipal Finance of Transport Infrastructure

6.41 Overall, transport investments have increased their share of local expenditures rapidly in recent years. It is uncertain whether the proportion of municipal outlays for transport can grow much further without affecting other priorities. Restructuring subway finances will be costly and these will be in addition to outlays associated with expansion plans. Municipal-owned parking is priced below private spaces and equalization could enhance revenue flows, as well as help moderate demand.

6.42 With buses and taxis privately owned and financed, the primary transport services supported by municipal investment are roads, subways and parking facilities. These investments have been funded by a combination of special taxes and general fund allocations. Special taxes on motor vehicles (excluding subway bonds) historically have accounted for roughly 15% of municipal tax collections, with a recent upward trend, to 20%. (It should be noted that revenues from taxes constitute roughly one-half of total municipal revenues.) Transport expenditures have been supplemented from general fund revenues on average, on a one-to-one basis with a spike in general fund support in 1984, coinciding with major subway construction, and much lower levels of general fund support in 1988 and 1989 during a period of economic slow-down.

6.43 Between 1983-91, transport outlays averaged almost 7% of municipal outlays, with a one-time jump to almost 13% in 1984. Since reaching a low of 4.8% in 1988, transport's share

of municipal expenditures has moved upward annually to 8.3% in 1991.[2] This trend is projected by KOTI to continue through 1994 when transport outlays are expected to level off at roughly 11.5% of municipal outlays. From 1993-97, general fund support is expected to gradually increase its supplement to receipts from vehicle taxes until reaching roughly a one-to-one match.

6.44 Sources of local government support include limited purpose subway bonds and revenues from the following:

- Vehicle acquisition taxes
- Vehicle registration fees
- Road taxes
- License taxes

6.45 Between 1993-97, vehicle-related taxes are anticipated to yield approximately W14.34 trillion. However, these tax revenues flow into the local government general fund and must be allocated to transport projects, i.e., transport investments must compete with non-transport alternatives. In addition, special taxes have been imposed in some cities. For example, in 1992 Pusan began to levy a tax on the movement of containers in order to finance port-related road improvements. Proceeds from this special tax are anticipated to increase from W43.2 billion in 1993 to W62.6 billion in 1997. Localities also tend to shift the proceeds of parking fine collections into development of new, off-street parking facilities.

6.46 General fund municipal revenues are anticipated to provide W15.92 trillion in addition to the vehicle-related tax sources.

6.47 Municipalities' general fund support for transport has been enhanced by increased revenues from urban growth policies and real estate taxes. For example:

- Strict land use controls have yielded a healthy concentration of high-value commercial development within the urbanized areas served by the rail networks;

- Sites whose value is increased as a result of proximity to urban rail improvements are subject to special value increment taxes that can claim one-half the rise in assessment attributed to the new use. These taxes are paid to the Government and are returned to the municipality.

- Properties whose value increases at a faster rate than the overall level of assessments are also subject to special taxes at the national level which are shared with the localities.

- Initial investment in transport infrastructure required to support major urban redevelopment and new town or satellite city development is funded from the proceeds of land sales to the private sector through the Seoul Development Corporation or the KLDC. The Seoul Development Corporation will generate W100 billion in 1994 from its redevelopment projects for the benefit of the subway, or about 5% of anticipated capital outlays for system expansion.

[2] Shon, 1993, p. 31.

- New land development projects may be obliged to purchase subway bonds, as well as pay impact fees, to offset the infrastructure costs imposed by the travel demands of future tenants and residents.

6.48 Municipalities obtain investment funds through special subway bonds. Purchasers of automobiles and real estate developers are required to buy subway bonds dedicated to investments in the jurisdiction where the vehicle is registered or the real estate project is located. These are similar to "zero coupon" obligations, with principal and accrued interest at 6% due in a "balloon" after 5 years. In 1994, the Seoul Subway system anticipates issuing over W400 billion of subway bonds for its annual capital program of about W2 trillion. Pusan plans to receive W552 billion from subway bonds between 1993-97, representing about 23% of total borrowing planned for this period.

6.49 Highways will absorb about 70% of anticipated transport expenditures, increasing six-fold to almost W9 trillion from 1993-97, compared to W1.47 trillion from 1987-91. Subways account for 29% of transport outlays, with local revenue covering about 75% of total subway expenditures. Municipal road commitments of W21.4 trillion from 1993-97 will represent over 50% of Korea's highway investments over the next five years.

6.50 In summary, municipalities are heavily burdened by the existing levels of transport investment. Major expansion is planned for the future nonetheless and there is an "overhang" of outstanding subway debt which must be added to the resource requirements anticipated over the next five years.

The Problem of Subway Finance

6.51 Financing the W9 trillion of local capital for planned subway projects will pose a major challenge for municipalities. Historically, the Government provided only 30% of subway funding in the form of equity and loans (originally 15% each), with a recent shift toward more equity participation in the expansions and new starts.

6.52 In Seoul, subway debt has been managed through increased subsidies from the city. Seoul's municipal subway subsidies exceeded W1 trillion in 1992. However, Pusan effectively transferred the liability for W60 billion in annual debt service shortfalls incurred by its subway to the Ministry of Transport.

6.53 Pusan continues to repay principal and interest coming due with the issuance of new debt, primarily 5-year subway bonds, resulting in a snow-ball of liabilities whose restructuring is rapidly becoming inevitable. While expansions of the Pusan system are anticipated to be funded with higher proportions of Government (25% as a grant instead of 15%) and local government (20%) equity, the current liability for repayment of W1.4 trillion in debt constitutes an obligation that must be added to any projection of future investment outlays for new lines.

6.54 Due to Seoul's unique scale, new rail starts in Taegu, Inchon, Kwangju and Daejon should be compared to the fiscal condition of Pusan's subway system. Table 6-1 portrays the magnitude of the need for restructuring Korea's subway financing strategies.

6.55 Essentially, W2.1 trillion of the W9 trillion anticipated to be spent on subways between 1993-97 will be invested in an expansion of the Pusan Urban Transport Authority (PUTA).

During this period, PUTA's interest payments alone will be almost six times its internally-generated resources. Despite Government and City of Pusan subsidies and equity infusions of W1.12 trillion, new net borrowing of over W1.6 trillion will be required. PUTA remains in the position of borrowing to make its interest payments and never generates sufficient revenue to carry its debt burden.

Table 6-1: Pusan Urban Transit Authority (PUTA) Financing
(Billions of Won)

	1993-1997	1998-2000
Capital Projects	2,096.4	180.1
Total Internally-Generated Sources of Funds	118.6	349.5
Interest	696.9	805.0
Gross Borrowing	2,419.6	1,742.1
Less: Principal Repaid	(815.8)	(1,451.6)
Net Borrowing	1,603.7	290.5
Central Government Equity	828.3	225.0
City of Pusan Equity	293.0	180.0

Source: PUTA, 1993.

6.56 Moreover, PUTA's W1.5 trillion in debt service obligations between 1993-97 represent capital expenditures that are over the W2.1 trillion included in the 5-Year investment plan for expansion. PUTA's debt is almost double the value of its fixed assets and approximates the City of Pusan's total annual expenditures of W1.34 trillion in 1994. Restructuring W1.1 trillion in existing debt and undertaking W2.1 trillion in system expansion, for a total of W3.2 trillion, represents a more complete picture of capital needs over the next five years.

6.57 In 1992, the Seoul Subway Corporation devoted almost 40% of its capital budget and over 50% of its municipal capital contribution of W823 billion to debt service (principal and interest). In 1990, subways consumed about W317 billion, or 21% of Seoul's "special account" expenditures of approximately W1.5 trillion[3]. By contrast, in terms of local effort, Pusan's support for PUTA is derived from a total budget (general and special accounts) that is about one-fourth of Seoul's, but the 1990 subway budget allocation was only W4 billion, or one one-hundredth of Seoul's.

6.58 Utilization of the Seoul subway is extraordinary, with ridership tripling from about 1.1 million passengers per day in 1984 to over 3.2 million in 1990. *Nonetheless, debt service was almost five times net operating revenues in 1992!* Until 1994, subway fares have remained static, with revenue growth primarily attributable to higher ridership.

6.59 Phase II of the Seoul subway (to be built between 1989-97) at a cost of about W8.3 trillion (1992 constant prices) is anticipated to be funded with 45% equity contributed by the Seoul

[3] *Seoul Statistical Yearbook*, 1991, p. 407.

City general fund and the Government's special transportation account. Subways will absorb about W800 million in 1994 of the City's infrastructure investment budget of W1.7 trillion. An additional 20% of subway investment is to be contributed by the Government from its appropriations outside of the special account.

6.60 The remaining 35% is to come from loans that would presumably be backed by the city. The debt is comprised of a package of subway bonds, bi-lateral concessionary loans from OECF (about W450 billion at 4% interest, a 25-year term and 7-year grace period), and other overseas public bonds arranged through the Ministry of Finance. It should be noted that from 1985-89, no new construction was undertaken due to a subway-related financial crisis, which the city resolved through higher subsidy payments.

6.61 Subway revenues in Seoul and Pusan appear to be adequate to cover operating and maintenance expenses as well as the replacement and renewal costs of rolling stock. *This is a better fiscal performance than almost any of the urban rail systems in the world.* Fare increases in 1993 of 35% resulted in virtually no diminution in ridership, a truly incredible outcome that will go a long way toward helping revenues catch up with many years of cost increases. Further improvement may be possible through cost controls and implementation of more regular fare increases. However, as the situation in Pusan amply demonstrates, it is unlikely that user fees from subways can sustain even a modest level of investment in expansions and new systems.

6.62 In summary, the municipal finance of subway investments will be a major challenge. Much of the non-Government share of urban rail investment is intended to be funded through borrowing. Various types of bonds are issued through the municipalities and subway corporations, and loans are provided by the Government. However, operating revenues have not proven adequate to cover debt service regardless of the terms, and substantial subsidies have been required from municipalities and, in the case of Pusan, the Government. The implications are that new sources of finance may be needed to re-fund existing debt and thus not be available for new investments, and that grants, rather than loans, may have to be used to build new subways.

New Opportunities for Financing Urban Transport

6.63 The discussion above suggests that the critical finance problem in Korea's urban transport sector is generating resources for road and subway capacity expansion without crippling municipal budgets. Increased equity flows from the Government are anticipated for urban transport, as the pool of dedicated revenues in the national special account increases, and distribution methods are modified to permit subways to receive a greater share of resources.

6.64 In addition, several important opportunities for new revenues and private sector participation can be envisioned based upon international experience.

Debt Restructuring

6.65 While Seoul's larger tax base has permitted subway debt to be managed in recent years, PUTA's debt situation is not sustainable and the situation is likely to be repeated in other new subway systems. Two adjustments will be necessary. First, an increased proportion of the investment in new facilities will have to be made on an equity basis (cash grants) by central and municipal governments. Realistically, all capital outlays other than rolling stock should be funded

with equity contributed by the municipality or Government. Second, the magnitude and short-term nature of subway borrowing is exacerbating the imbalance between cash flows and debt service, with PUTA the obvious example. Politically, the mechanisms developed to work out PUTA's debt will serve as important precedents for Seoul and the other new subway systems.

6.66 If PUTA's expansion plans were extended to 1996-2000, fares were increased an average of W50 per year, debt was converted to long-term bonds issued on terms comparable to the Government Financing Fund, and cash grants were used to meet upcoming peaks in principal payments due in 1995 (W150 billion) and 1998 (W70 billion), PUTA's financial viability would be established.

6.67 One mechanism for re-financing subway debt would be to exchange outstanding short-term bonds for longer-term securities. The exchange could be at the option of existing bondholders, as well as by using the proceeds of new long-term bonds to repay short-term debt holders as they become due.

6.68 The long-term securities also could be used to finance higher levels of Government equity investment in new subways. The Government would raise capital through issuing long-term debt that it would invest as equity in subway expansion.

6.69 One approach to refinancing the debt would be via a surcharge on existing gasoline and diesel fuel taxes. These taxes currently generate about W3.5 trillion a year. Multiple goals could be accomplished through a revenue bond strategy:

- The surcharge could be used to increase both gasoline and diesel fees, or to bring diesel taxes into greater parity with gasoline taxes. By reducing the incentives to purchase diesel engines, negative environmental impacts could be mitigated and potential revenue leakage minimized;

- The higher taxes would marginally increase the cost of driving and help discourage auto trips;

- The pledge of the incremental tax revenues to the new bonds need not carry a back-up commitment from the Government. This would constitute a limited commitment, rather than a sovereign guarantee. However, the security would be strong and the interest rate slightly higher than a full faith and credit obligation. The result could be to enhance investor appeal and assist in deepening the capital markets in terms of both maturity and risk alternatives. Depending upon market conditions, added incentives in the form of full, or partial income tax exemption could also be considered as a feature of new revenue bond obligations.

- A long-term revenue bond also might be offered to foreign investors as a means of attracting direct investment, but channelling the resulting capital flows into a long-term security (perhaps with some liquidity constraints) that would minimize the need for sterilization. Foreign investors already are familiar with the concept of a revenue bond.

6.70 Depending upon the level of the surcharge, sufficient cash flow could be created to accomplish the refunding of PUTA and Seoul subway debt, as well as converting the Government's 30% share of the capital investment for new facilities into grant equity.

6.71 Further, the concept of limited obligation debt also could be extended to the municipalities. Local governments could increase their vehicle-related tax rates and pledge the incremental revenues to long-term revenue bonds whose proceeds would be used for equity investments in new subway facilities.

6.72 Another variation could involve a matching formula whereby the Government's absorption of an agreed proportion of each system's refinancing and equity needs using revenue bonds would be matched by a revenue bond effort by the municipality.

Concessions and Franchises

6.73 With very strong ridership histories, and balance sheets cleared of short-term obligations as well as the burden of borrowing for capital expansion, the revenue potential of the existing subway facilities could prove attractive to private franchise operators.

6.74 Franchising the existing system could result in operating cost savings from managerial efficiencies, as well as higher revenue flows from retail concessions and other ancillary revenue sources. In exchange for the right to operate and maintain the Pusan subway for an agreed time frame, subject to an approved structure for raising fares periodically, a franchisee could offer proposals to the Seoul and Pusan Subway Corporations in several forms that would result in immediate capital resources to finance further debt restructuring and the development of new facilities:

- Provide an up-front cash payment for the right to operate the facilities;
- Provide an annual rental payment for use of the facilities, which could be capitalized by the central or local government (or both);
- Provide a minimum annual rent, with a participation in revenues above a base level;
- A combination of some of the above.

6.75 In turn, the private franchisee could raise the funds to support its commitments from Korea's capital markets. These resources could be derived from issues of common and preferred stock in the franchise entity, as well as short and long-term debt to be repaid from future net revenues. Here again, special financial instruments could be created that are targeted to institutional investors (pension funds and insurance companies), foreign sources of capital, and individuals. The spin-off benefits could also include deepening the financial markets by introducing new forms of securities with different risk/reward ratios and maturities.

6.76 The expansion programs now underway in Seoul and Pusan would be undertaken publicly. Once the works were completed, subject to an acceptance process, they could be furnished to the franchisee who would then operate both the existing and new facilities. This structure would permit construction risks to be borne publicly and would allow the revenues from the existing system to help defray the costs of the expansions.

6.77 In addition to existing subways, some municipally-owned toll facilities are also operating which offer franchise potential, if some pricing flexibility is provided. For example, the Namsan 3 and Bugak tunnels in Seoul generate about W4.5 billion per year with a toll of W100. This could easily be raised to W400 and produce an additional W10-12 billion a year. These incremental revenues could be capitalized through a franchise or concession arrangement.

Asset Sales

6.78 Another privatization option involving existing facilities could extend to public parking garages. Surface spaces and some off-street publicly-owned parking garages exist and plans have been made to increase them. These facilities occupy valuable real estate and some have established revenue histories.

6.79 However, public garages generally charge lower tariffs than private car parks and the lower rates constitute a pricing subsidy which may be encouraging additional auto use. Selling the public facilities to private operators would help equalize the two rate structures and permit the public sector to capitalize the revenue increment. Moreover, by returning the garages to the private sector, real estate tax revenues could be collected adding to public revenue flows. If desired, additional development could be permitted on the parking site, thus allowing a substantial gain in land value to be created.

Real Estate Development

6.80 At this time, the public sector appears to be well-equipped to capture the ancillary real estate benefits from transport projects in urban areas. Typically, private management of retail concessions increases revenue flows. For example, the New York City subways retain management firms to operate retail space in certain high value locations. Not only are ancillary income streams maximized, but adjacent property owners also benefit from the higher quality of property management.

6.81 Korea has some experience using land development to help finance investment. Box 6.4 summarizes KNR's Seoul station development. This example shows that relying on real estate cross-subsidies may take some time to come about.

6.82 The KLDC and Seoul Development Corporation have also used real estate to generate infrastructure finance (see Box 6.5). Similarly, Hong Kong's land development experience with mass transit is known for generating substantial resources (see Box 6.6), but once again illustrates that this approach can only generate a fraction of the finance needed for these large investments.

Box 6.4 Seoul Station Development - Korea National Railways:

In March, 1989 a joint development project involving KNR and several private entities was opened at Seoul Station. The project was intended to generate non-user fee revenues for KNR through the development of underutilized real estate assets. The development involves three stories above ground and two stories below ground of primarily retail uses on land and air rights owned by KNR at the main commuter and inter-city train station in downtown Seoul. The total project cost was approximately W15.6 billion, with W10.0 billion raised from paid-in capital.

Despite strong initial investor interest only two private proposals were received when the project was tendered. The winner of the competition subsequently had to be replaced due to a change in the tax status of the program. In order to secure a private development partner, KNR not only had to contribute 25 percent of the paid-in capital, it also had to include the development rights for Chung Rang Ri Station and provide a ground lease which forgoes rent until a target net profit level is achieved.

While gross sales at the Seoul Station development have shown strong growth, rising from W8.555 million in 1990, the first full year of operation, to W14.772 million in 1992, the project failed to produce an operating profit during this period. As a result KNR has received no rent payments, while having to make an initial W2.5 billion investment in order to see the project realized. Nine other railway stations are being redeveloped under similar arrangements. Dong Inchon (Joint Company established 12/86) and Yong Dung Po (Joint Company established 9/86) are presently in operation, while Bu Pyong, Bu Chon, Chung Rang Ri, Dae Jun, Dae Gu, Wang Ship Ri and An Yang are under design or construction.

The KNR Seoul Station example also demonstrates that all sites are not necessarily high income generators and that there may be a lag between the time real estate projects are initiated and profits are generated, or profits may not be realized altogether. If public corporations will be required to make equity investments, or forgo ground lease payments in order to attract investors, the impact of such "private sector" arrangements could become negative on resources for social infrastructure investment.

Source: KNR.

C. Applying "Gap-Filling" Strategies in Inter-Urban Transport

6.83 The next sub-section reviews the financial implications of changes in pricing policies and financing practices in the inter-urban transport sector (including road, rail, airports and ports).

Resource Mobilization Practices in Inter-Urban Transport

User Fees and Taxes in Land Transport

6.84 Financing for land transport in Korea has come from a wide array of sources including taxes, direct Government equity, user fees and borrowing, both domestically and overseas. Rail fares, toll rates, bus fares and trucking tariffs have drifted upwards under a complex structure of price controls, entry regulations and cross-subsidies, rather than in response to actual changes in cost levels and demand.

Box 6.5: Value Capture Strategies: Korea Land Development Corporation and the Seoul Development Corporation

The Korea Land Development Corporation (KLDC) undertakes the development of satellite cities and industrial estates. It acquires raw agricultural land, performs master planning, constructs on-site and off-site infrastructure and sells the resulting parcels to developers, primarily for residential purposes. Typically, 35 percent of the land is reserved for public purposes such as schools and hospitals, another percentage is set aside for subsidized housing, and 5 - 10 percent is auctioned on a market basis. Sufficient profits are generated from the change in use and infrastructure improvements to pay for the land and development costs, as well as repay any short term borrowing required.

The KLDC role can be viewed as that of an enhanced redevelopment authority (although almost always involved in "greenfield" rather than redevelopment sites) with the resulting on and off-site infrastructure investments even more extensive than those associated with "proffers" from private developers in the United States and other western countries.

Seoul Development Corporation plays a similar role in acquiring land in advance of subway construction, assembling sites and deriving benefits from a change in land use. These gains are re-cycled into payments that are used to support Seoul Subway investments. About W100 billion will be generated from these activities in 1994 out of the anticipated W2 trillion in Seoul Subway investment.

The KLDC experience demonstrates that profits from real estate development can be substantial when a change in use is permitted and the increments in value are not immediately taxed. The Seoul Development Corporation places the relative contribution from land development toward investment at approximately 5 percent (W100 billion in 1994 out of planned investments of W2 trillion). This is also the range of contribution from development-related activity anticipated in the finance plan of the high speed rail program. Given the high value of land in the Seoul metropolitan area, it is likely that the 5-percent range established in connection with the subway development program represents a realistic "maximum" projection under the present tax structure.

Perhaps most significantly, the Seoul Station project, KLDC arrangements and the municipal "value capture" real estate tax mechanisms also demonstrate that the value of land assets can be tapped even within a context of public sector ownership and operation of the underlying transportation systems.

6.85 Under the present regulatory regime, the basis for future increases in user fees and prices is not predictable. This uncertainty has not only led to periodic financial shortfalls, but constitutes a major deterrent to attracting additional private investment into the transport sector.

6.86 The size of motor vehicle taxes in the revenue base of the Government may be found in Table 6-2, which shows revenue data for 1983-92 from three of the major sources: gasoline, diesel and excise taxes. It also shows the relative share these revenue sources represent in terms of total Government taxes. The share remains relatively stable at about 3.5%-4.0% from 1983-90, with a slight increase in 1991-92. By and large, the gasoline and excise tax revenues grew at annual average rates of 24%-27% respectively while the diesel tax revenues grew at only 7.8% a year. The growth in gasoline and excise tax revenue is closely related to the dramatic increase in vehicle

ownership, and not necessarily to higher tax rates. Given the restrictions on increasing user charges over the years, this suggests there may be considerable potential for increased revenues through higher gasoline and excise taxes. Diesel revenue yields grew at a much lower rate--reflecting their already low tax rates and the more limited growth in the diesel vehicle population.

Table 6-2: Korean Central Government Vehicle-Related Tax Revenues 1983-1992

Year	Vehicle Taxes				Percent of Total Central Govt. Taxes
	Gas Tax	Diesel Tax	Excise Tax	Total Vehicle	
1983	183.5	102.5	60.6	346.6	3.4
1984	207.5	119.0	73.0	379.5	3.6
1985	271.2	123.4	88.6	483.2	4.0
1986	304.9	113.5	105.5	523.9	3.8
1987	351.3	101.5	149.3	606.2	3.6
1988	360.1	105.4	209.7	675.0	3.3
1989	372.3	118.5	312.7	803.5	3.6
1990	457.4	124.8	418.7	1,009.5	3.5
1991	779.9	155.7	504.3	1,439.9	4.5
1992	1,265.5	201.8	528.1	1,995.4	5.3
Annual Rate of Growth	23.9%	7.8%	27.2%	21.5%	--

Source: Korea Transport Institute, *Mid-Term Financing Report*, Table 4-2, page 85, 1993.

6.87 A table showing the pattern of user fee revenues at the local (regional) level reflects a similar pattern, indicating a further potential for increased revenues at this level of government (Table 6-3).

6.88 Although there appears to be potential for increased revenues from higher user fees and tax rates, the gap between revenues and future requirements for infrastructure spending indicates that some additional form of financing will be needed, such as borrowing or private capital. In Table 6-4, fuel and excise taxes are anticipated to cover about 70% of planned Government transport infrastructure expenditures in 1993, but are projected to shrink to little more than 50% over the next few years.

Box 6.6: Property Development and Urban Rail Systems in Hong Kong:

Both the MTR and KCR (Kowloon-Canton Railway) have used property development to help finance the capital cost of their rail systems. Rail associated developments in Hong Kong include: major office buildings in the central business districts, major residential developments built on podium structures over the rail depots with up to 5,000 apartments in each, and other miscellaneous buildings along each line. The MTR estimates that the property profits have provided about 15% of the capital cost of their system (US$3.2 billion).

The two rail corporations have been allowed to develop sites over and adjacent to their railways, primarily over stations and above maintenance depots. Land assembly is not an issue in Hong Kong since the government has compulsory purchase powers over lands required for rail construction. However, the two rail corporations were required to pay full market price for the development rights to each site.

The developments were undertaken in partnership with professional property developers who were chosen competitively. The rail corporation provides the site. The developer finances and constructs the development. Once chosen, they were required to make a very substantial payment to the rail corporation. This up-front payment insulates the rail project from risks of delay and profitability associated with the real estate undertakings. Down stream profits are shared, as agreed during each project negotiations, in order to provide some participation in future cash flows generated.

Source: Financing Transport Infrastructure and Services, R.G. Scurfield, EDI, 1991.

Public Corporations in Land Transport

6.89 Chapter V concluded that greater pricing freedom for both private and public corporations in the rail and road sector would foster more efficient operations and self-financing of most services. The following section considers the revenue-generating prospects for public corporations in land transport (see Annex 2 for financial data).

6.90 **KNR.** The financial condition of KNR has improved recently. Annual operating losses have been replaced by operating profits that are in a relatively favorable balance with interest outlays. However, an increase in direct Government investment (W27 billion in 1987 to W151 billion in 1990) was needed to offset the impacts of government price regulation. The change can be related to strong traffic and W114 billion in rate increases granted for 1991 and 1992, and will be further enhanced by another W216 billion in higher fees granted for 1993 and 1994.[4] In addition, the discharge of W1.5 trillion of KNR debt will free resources for capital outlays. But the internal revenue generating capability of KNR is still limited. In 1991, internally-generated revenues were less than 40% of investments. Additional sources of finance will be necessary for rail investments, especially for HSR.

6.91 **HSR.** The other major factor in rail capital outlays over the coming years will be investment in the Seoul to Pusan high speed rail program, expected to cost W10.74 trillion and representing the largest public works program ever undertaken in Korea.

[4] KNR, *Status of Tariff Increase*, undated.

Table 6-3: Local Government Vehicle-Related Revenues 1983-1992

Years	Local Government Vehicle-Related Revenues				Total Local Govt. Revenues	Percent of Total Local Tax Revenues
	Excise	Registration	Road Tax	Licenses		
1983	39.7	33.0	83.8	11.0	167.5	12.0
1984	46.3	34.5	103.7	13.2	197.7	13.1
1985	51.5	43.1	118.3	15.5	228.4	13.8
1986	58.3	52.4	139.1	18.0	258.1	14.8
1987	74.0	82.5	167.6	22.5	346.7	15.8
1988	108.7	130.2	218.1	28.4	485.4	15.7
1989	149.7	210.1	304.3	37.4	701.6	14.1
1990	212.8	289.8	378.9	47.3	928.8	14.7
1991	263.9	483.0	684.9	59.3	1,491.1	18.9
1992	294.0	530.1	829.2	73.0	1,717.3	20.8
Annual Rate of Increase	24.9%	36.1%	29.0%	23.4%	29.5%	6.3%

Source: KOTI, *Mid-Term Financing Report*, Table 406, page 89, 1993.

6.92 About W1.7 trillion for HSR rolling stock will be financed through credits negotiated with the vendor that involve 18-year debt with an 8-year grace period[5] and sovereign guarantees.

6.93 Since no revenue will be generated during the HSR construction period, heavy Government outlays will be required over the next five years for the high speed rail program: 35% or W3.76 trillion of the total project cost is anticipated in the form of direct Government equity. An additional 10% is expected from a 15-year Government loan carrying a 5-year grace period.

6.94 Approximately 31% of the project is expected to be funded with domestic bonds issued by the high speed rail corporation and 6%, or W645 billion, is expected from real estate development-related sources. The balance will be financed with vendor credits.

6.95 **KHC.** In the road sector, KHC has played a major role in mobilizing financial resources for investment. The dramatic increase in investment expenditures at KHC is quite different from the more modest fiscal trends at the other public corporations. It has supported a 600% increase in capital outlays from a 430% rise in net toll revenues over 1987-92. A 25% drop in net revenues between 1990-91 was accompanied by an increase in capital outlays of almost W800 billion. While toll increases and traffic improvements almost tripled net revenues between 1991-92, the accelerated capital program has produced an extremely large increase in short and long-term debt from about W230 billion in 1989 to almost W2.1 trillion by 1992. The debt, particularly the high

[5] *Journal of Commerce*, April 19, 1994.

proportion of short-term borrowing, will hamper KHC's ability to contribute investment resources from internal sources in the coming years.

6.96 It is unclear at this point whether the run-up in KHC capital outlays will result in new facilities coming on stream shortly that will generate sufficient revenues to permit the increase in borrowing to be serviced without a major debt restructuring. However, a preliminary review of the costs of road construction suggests it is unlikely that toll revenues will be able to substantially offset investment needs unless major price adjustments are made.

Table 6-4: Projected Central Government Vehicle-Related Revenues and Planned Infrastructure Expenditures 1993-1997

Source of Government Revenues & Planned Expenditures	1993	1994	1995	1996	1997	Totals for 1993-97
Gasoline Taxes	1,534	1,943	2,368	2,823	3,276	11,944
Diesel Taxes	306	525	599	680	768	2,878
Excise Taxes (pvt. car)	628	693	762	827	894	3,804
TOTALS	2,568	3,161	3,729	4,330	4,938	18,726
Govt. Infrastructure Expenditures	3,718	5,570	7,152	8,399	8,810	33,694
Revenues-Expenditures	(1,150)	(2,409)	(3,423)	(4,069)	(3,872)	(14,923)

Source: KOTI, *Mid-Term Financing Report*, text table, page 109, 1993.
( ) Parenthesis indicates negative value.

6.97 According to KHC, the average costs for 4-lane urban facilities are about W30 billion/kilometer and rural highways average about W10 billion/kilometer. The highest cost thus far for a 4-lane toll road was W58 billion/kilometer. These prices appear to exceed the most costly urban freeways being completed in the United States (W58 billion/km translates into about US$115 million per mile for four lanes, with the US figures for projects in this cost range typically yielding six and eight-lane facilities). KHC reports that land prices average 70% of project capital costs within urbanized areas and about 50% in rural areas. Operations and maintenance costs average W100 million/kilometer per year.

6.98 Assuming an average capital cost of W25 billion per kilometer and a capitalization factor of 10%, then W2.6 billion/kilometer of new revenues would have to be generated annually to amortize capital and operating costs (W2.5 billion to service capital and W0.1 billion for O&M) for new facilities.

6.99 By contrast, in 1992 KHC yielded approximately W0.35 billion per kilometer (W569.823 billion in toll revenue per KHC on 1,644 kilometers of tolled expressways (see Table 5-9). *Revenues per kilometer would have to increase almost ten-fold to cover the capital and operating costs of the average new urban toll facility.* In the most heavily-utilized segments of the

system, only pricing adjustments will be able to increase revenue yields, as capacity to carry more vehicles becomes increasingly constrained. While the table below shows a favorable trend in revenues/kilometer, it is unlikely that new toll facilities can be brought on stream in the years ahead without significant central and local government subsidies, access to long-term debt and toll increases. Moreover, the aggregate figures tend to distort the relative yields of individual KHC routes, many of which under perform the system average.

6.100 A disturbing trend accompanying the dramatic escalation of highway investment is the decline in operational road capacity which the expenditures yield. Between 1986-90, Government budget outlays for national trunk roads increased 34.5% per year, while road capacity (in km) increased only 3.3% per year. A comparable trend can be seen in the urban road sector, with an average annual increase in municipal outlays for roads of 37.9% between 1986-90 and road length increases over this period of between 0.9%-2.8% per year in the major cities. The disparity between fiscal effort and new operational capacity is explained largely by land acquisition costs, and possibly the jump in interest expenses as well.

Table 6-5: KHC Annual Revenue/Kilometer

Year	Length (km)	Toll Revenue (billions of won)	Annual Revenue/Kilometer (billions of won/kilometer)
1988	1,551	218.335	0.141
1989	1,551	270.756	0.175
1990	1,551	323.292	0.208
1991	1,597	406.331	0.254
1992	1,644	569.823	0.347

6.101 The proportion of national trunk road expenditures for land rose from 16% of project costs between 1985-87, to 41% between 1988-91, and then to 63% between 1990-93. These trends suggest the rapid increase in KHC investment in recent years is unlikely to be supported by operating revenues alone.

Resource Mobilization Practices in the Aviation Sector

6.102 Until 1990, non-military airports were built, owned and operated by MOCT. Although it continues to provide the capital for construction through Government equity grants, KAA now has operating and maintenance responsibility for all Korean airports.

6.103 The planned KAA investments for the next few years (1994-98) are heavily dominated by the NSMA. But even the other annual KAA, MOCT, and private investments required to prevent bottlenecks from developing will require substantial investments, far exceeding KAA's current revenue outlook. The existing financial arrangements are being re-examined for the future in light of the W4.0 trillion anticipated to be required for the NSMA airport. In 1992, KAA invested W11.7 billion in NSMA from its internally-generated resources (Annex 2); however, between 1993-97,

NSMA investment is projected to be W2,888 billion.[6] It is also interesting to note that in 1992, KAA paid W5.1 billion in corporate and other taxes (and over W8.0 billion in 1991), about 44% of its investment in NSMA (KAA income statement).

6.104 The discussion in Chapter V has shown substantial potential for further increases in KAA revenues from landing fees, passenger taxes and rents, without jeopardizing the competitiveness of KAL and AAR. Such increases could amount to as much as W40-70 billion per year, and would help close the projected funding gap for KAA's non-NSMA investments (see Table 6-6).

6.105 For example, the aircraft-related user charges are substantially below what they are in comparable airports in the region and elsewhere. In 1993, landing fees for international operations were about two-thirds of an international average. Domestic landing fees for the same aircraft were a fraction of this amount. If all landing fees were increased to put the international landing fees at par with the international average (i.e., 46%), the additional revenue generated (assuming an inelastic demand, not an unrealistic assumption) would amount to W21.4 billion. Since domestic landing fees are very low at present, increasing them should make it possible to raise a total of W30 billion.

Table 6-6: Potential Revenue Generation From Raising of Airport User Charges to International Level, and Domestic User Charges by the same Percentage
(1993 Won Billion)

Revenue Source for Increased Income	Additional Revenue (Billion Won)
Landing Fees	30 Billion Won
Aircraft Parking Fees	6 " "
Passenger Departure Taxes	25 " "
Total Incremental Revenue	61 Billion Won

Source: Estimation.

6.106 Aircraft parking charges in Korea constitute only 37.5% of the international average, but even if they were raised to the international level i.e. (tripled), the revenue generated would be no more than W6 billion. The departure tax for international passengers is 64.5% of the comparable international level. If raised 50% to match the level in other countries, and if the much lower domestic departure taxes were raised by the same percentage, the additional revenues generated would amount to W17 and W8 billion respectively.

6.107 In total, these measures could generate W61 billion (complete price inelasticity assumed), which is equal to 20% of the 1993 public airport investments of Korea (including the NSMA share).

6.108 KAA's capital scarcity has prompted a search for alternative funding sources. Recently, private participation in the financing of airports has been encouraged. KAL has financed the second Kimpo passenger terminal and transferred the ownership to MOCT, in return for free use of the facility for the next 20 years. This type of investment is not necessarily "additive" in that

[6] Shon, 1993.

KAA could have financed the terminal and amortized the costs through future rents from the airlines as a self-financed project. Given the strong position of KAL at Kimpo, the long-term costs and benefits of this privatization strategy remain to be determined insofar as their competitive effects on other airlines and the level of savings attributable to managerial efficiency are considered.

6.109 In addition to modest landing fees, another cross-subsidy received by KAL to offset the impacts of low domestic fares involves the delivery of airport services. For example, fuelling is often an income generator for public airport authorities, yet this profit-yielding service has been turned-over to KAL. The result of these cross-subsidies is to limit the fiscal capacity of KAA to internally generate investment resources for the NSMA, as well as other airports in Korea whose capital programs are supported by surpluses generated at Kimpo.

Resource Mobilization in the Port Sector

6.110 This section reviews the financial position of the Korean port system and the contribution of port user charges to funding infrastructure and operations.

6.111 Tax revenue has played a crucial role in financing Korean ports. Historically, the Government funded port investment and guaranteed development loans from international sources. Ports have benefitted from relatively modest borrowing on favorable terms and substantial infusions of Government equity for capital investment. Government investment in port facilities exceeded W460 billion between 1990-92. A recent restructuring of the role of the KMPA from being owner/operator of port facilities to a lessor will occur in 1996. This change will bring a large increase in cash flows, as well as greater private sector responsibility for future capital outlays.

6.112 In addition, KMPA's fiscal performance has been affected by the creation of KCTA, which receives KMPA's rents from container facilities. In recent years, flat tariffs restrained port revenues while operating expenses for salaries and overhead increased (see Table 6-7). Modifications in valuing port assets for depreciation also affected operating income negatively, but improved cash flow. An increase in tariffs of 5% in 1994, the first since before 1990, is expected to represent a more aggressive approach to pricing. Responding to pressure from rising demand, KCTA will be borrowing W370 billion over the next five years to expand container operations. Private sector financing arrangements have already secured W200 million of these requirements.

6.113 As seen from Table 6-7, the financial position of KMPA remains very strong in terms of operating revenues compared to operating costs. The annual net cash flow from operations has been able to finance almost 30% of capital spending, and the Government continues to provide almost 60% of KMPA's capital investment program. KMPA's capital structure is thus very strong with a debt to equity ratio of only 4%, a debt service coverage of almost 1.4 times, and a self-financing ratio of almost 20% in 1992.

6.114 KMPA and KCTA are undertaking substantial capital improvements in Pusan and Kwangyang Bay container facilities using private investment by shipping companies. Pusan's third development phase is being implemented through a lease with the Pusan East Container Terminal Company (PECT) that is 75% owned by 11 private stevedoring companies and 25% owned by KCTA.

Table 6-7: Trend of KMPA's Financial Operating Performance and Forecasts
(Billion Won)

Item	1989	1990	1991	1992	1993	1995	1998	2000
Operating Revenue	132	136	136	139	184	237	360	465
Operating Expenditures	68	78	92	112	130	157	224	275
Debt Service	1.9	2.2	1.9	1.4	3.1	4.8	8.0	14.5
Self-Financing Ratio	NA	32.9	28.7	19.9	17.7	27.3	28.3	50.9

Source: KMPA.

6.115 The most recent privatization efforts also involve new containerization facilities. Eight new container berths are being developed (four under Pusan Phase IV and four in Kwangyang Bay) through private leases and self-financing.

6.116 Four tranches of bonds of W50 billion each are being issued. The purchaser of each tranche will be granted a franchise to operate one container berth in Pusan IV and one in Kwangyang Bay. The purchasers will be selected based upon the rents offered for lease of the berths and current shipping volume. The bonds are Government guaranteed, 10-year securities with a five-year grace period and interest at 6% (accruing during the grace period and paid as a balloon afterwards). A one-fifth reduction in the tax rate payable on the bond interest earned is also provided. The underlying container berth leases will run for 10 years, with a minimum rent based upon a minimum throughput and additional rent payable on TEUs above the minimum throughput. The lessee will determine the charges paid by the vessel, effectively removing pricing from direct Government regulation. KCTA will provide the berths fitted with two container quay cranes each, with all other equipment and maintenance the responsibility of the lessee.

6.117 Under the KCTA privatization model, capital investment costs are largely borne by the private sector and amortized through lease payments. The private sector can control costs by providing favorable low-cost financing for the Government-guaranteed debt offerings that will underwrite the public improvements to be provided by KCTA as lessor. The structure permits KCTA to remove itself from the operational aspects of container movements, including pricing for the services provided to shippers and use of capital assets, and instead to become a lessor enjoying guaranteed minimum rent streams and an up-side participation in the volume of traffic. The Government guarantee also minimizes the cost of capital for new investment. Rents should be more than adequate to amortize capital costs, while operating and administrative costs are minimized.

6.118 The recent and rapid changes in the institutional, administrative and financial situation for the provision of port services is an impressive indication that Korea is able to act quickly when the need for structural change arises. The establishment of autonomous corporations with minority public ownership for the operation of container facilities illustrates this, as does the new regulations that will allow for complete private development and operation of berths. Obviously, investors will

not take up these offers unless they are granted the freedom to set port user charges that will provide for attractive direct or indirect returns on the investment.

Revenue Generation from Inter-City Transport

The Revenue Bond Concept

6.119 As discussed earlier, revenue bonds can be used to capitalize user fees and tax revenues on a long-term basis without requiring sovereign guarantees or corporate signature credits. Such tools are a building block for project finance and can be used to help address public corporation debt, deepen financial markets and generate new sources of capital for transport infrastructure. Their application in inter-urban transport includes highway and rail.

6.120 **Highways.** The Seoul-Pusan corridor accounts for about one-half of the KHC's toll revenues overall, with about 56% of all truck tolls and about 43% of all automobile revenue. Since it is about a 400-km corridor, the annual revenue per km was approximately W0.677 billion in 1992, or double the system-wide average, *but still about one-fifth of the level needed to finance new facilities in urbanized areas.* The heavy truck utilization of the Seoul-Pusan corridor also offers increased opportunities for balancing both the volume and timing of freight and passenger traffic flows through pricing.

6.121 If the tolls collected between Seoul and Pusan were doubled over the next five years, then KHC could generate roughly W300 billion in incremental revenues annually. Depending upon interest rates and assuming a longer-term debt structure, roughly W3 trillion could be generated in domestic and international capital markets. A revenue-bond issue could take out KHC's existing short-term debt, as well as provide capital to fund expansion.

6.122 The revenue-bond concept can be applied to incremental toll revenues, whereby gross receipts are irrevocably pledged to the repayment of debt. The grants and credit of the Government would *not* be pledged and it is also possible to segregate KHC revenues so that a pledge of all toll revenues need not occur. Security for the bondholders is based on the quality of the revenue stream which is pledged, future growth potential, debt service coverage, debt service reserves, and potential access to back-up revenue guarantees. (Toll revenue bonds are relatively common in the U.S., Mexico, France and the U.K.).

6.123 **Railroads.** A similar approach can be taken with railroad revenues. Assuming that Seoul-Pusan corridor passenger traffic accounts for one-half of KNR's revenues, or about W500 billion per year, a 50% fare increase over the next five years would generate about W250 billion per year, or a capitalization potential of roughly W2.5 trillion.

6.124 Capitalization of the KNR incremental revenues could come in several forms. The most likely approach to capitalization would be a higher valuation of the entity when it is corporatized in 1996. It is also possible that the revenues could be applied to an equipment leasing program that would cover new rolling stock, as well as the sale and leaseback of existing coaches, freight cars and power units.

6.125 With increases in road and rail fares, domestic air fares could drift upward and permit greater potential to raise airport-related fees. It was estimated (see Table 6-6) that the opportunity

to mobilize about W60 billion per year in new resources for KAA from fees and taxes was possible, based on comparable experiences in other countries. Capitalizing this revenue stream through revenue bonds represents about W500 billion in additional investment resources. Therefore, capitalizing new revenue streams from pricing adjustments along the Seoul-Pusan Corridor using long-term debt could yield approximately W6 trillion for airports, roads and railways.

Utilization of Existing Assets

6.126 While considerable emphasis is being placed on private involvement in SOC infrastructure on the drawing boards, the most immediate and potentially attractive opportunities for the Government to generate new sources of capital may be through the franchising, divestiture, securitization and refinancing of existing transport assets. In order to realize the value in existing assets, price reforms are likely to be required and a certain amount of debt restructuring may be necessary.

6.127 Examples may include disposing of underutilized land, franchising existing toll road facilities, the KMPA program to lease its multi-purpose shipping berths, leasing KNR's existing and future rolling stock, franchising operations and maintenance of the existing subway lines, or converting Kimpo Airport facilities made redundant by the new airport to alternative uses.

6.128 Corporatization and eventual privatization of corporations such as KNR can generate substantial financial resources. KNR is relatively efficient, with labor's share of revenues in the 50% range. As a result, corporatization and sale of stock can occur at a much lower net cost to the Government than recent experience in Japan (Koichiro, 1992). Assuming a reasonable measure of price deregulation, a conservative estimate of the proceeds from KNR's corporatization in 1996 would be the Government's equity in the railroad, or approximately W5 trillion. If combined with the pricing adjustment for the Seoul-Pusan corridor assumed earlier, the value could be about W7.5 trillion.

Land Assets

6.129 One of the most critical issues emerging in Korean transport finance is the ever-increasing share of project costs being devoted to land acquisition. Initiatives to reduce these direct, out-of-pocket costs by encouraging land owners to accept other forms of compensation may result in more physical capacity being realized per won invested in the years ahead. These mechanisms could include some or all of the following:

- **Identify real estate holdings now in public ownership and incorporate the underlying assets into a stock company.** A portion of the shares could be issued publicly, with earnings derived from land sales and rents. The balance of the stock could be used to effect swaps with owners of property in the path of new transport projects, in lieu of cash payments. The swaps could receive favorable treatment from income and real estate taxes, as might dividend payments. Trading the shares publicly would permit the owners of the stock to enjoy liquidity for their assets. Securitizing public land inventories would free the value they hold, while creating a mechanism for paying for transport-related land acquisition on an off-budget, in-kind basis, rather than in budgeted cash.

- **A variation of this approach would involve establishing mechanisms used in Korea and Japan for "land readjustment" or a "Community Fund."** In these cases, groups of property owners affected by transport projects could trade their ownership of individual parcels for a pro-rata interest in a larger assemblage. Changes in permitted land use would permit the property holders to benefit from higher land values, as well as offset the reduction in total land area under ownership for the "donation" to the transport project. Tax incentives also could be used to increase the attractiveness of these strategies.

6.130 With a likely need to acquire over W35 trillion worth of land (this assumes about half the proposed new transport investments go for land acquisition) in order to implement the contemplated transport investment plan between 1993-97, if only 5% of this total were "swapped" through securitization mechanisms involving land assets in public land inventories, then W1.75 trillion in cash expenditures could be avoided.

6.131 Further, it is possible that the contribution from real estate assets could be much greater if the existing Kimpo Airport was closed (or significantly downgraded) and redeveloped into an alternative higher use once the NSMA is completed. The Kimpo real estate assets could be included in a larger portfolio of securitized assets, or disposed of independently in separate transactions.

6.132 As mentioned earlier, dropping the ground link between NSMA and Kimpo would save an additional 1.1 trillion won and could offset the cost of expanding the first phase of NSMA to include capacity for domestic service. In addition, the present cost of operating Kimpo is approximately W100 billion per year; and, assuming the use of a single airport would eliminate considerable duplication of costs as well as operating subsidies to maintain the ground links between the two airports, it may be possible to save at least W50 billion per year in operating expenses if Kimpo were converted to alternative uses. These operating cost savings could represent the fiscal capacity to undertake another W500 billion in capital expenditures.

Broadening Government Support

6.133 At present, Government support for transport investment has come in the form of either direct grants or loans to municipalities and public corporations, or indirect cross-subsidies. In some cases, the loans may be on soft terms with maturities of 20 years, amortization over 15 years, and below-market interest rates.

6.134 In addition to the revenue bond model discussed earlier, a wide variety of alternate approaches to explicitly injecting Government support are possible that would constitute conditional sovereign obligations (rather than full faith and credit commitments) and yield less distortion in pricing and project financing. These mechanisms include: public service obligation payments, service contracts, take-or-pay contracts, and leases. Any long-term commitment of payments by the Government has the potential to be capitalized to provide investment funds. The private finance of the Prince Edward Island Bridge in Atlantic Canada is an example of capitalizing a PSO commitment by Government to build a new bridge to replace the ongoing ferry subsidies (see Box 6.7). Another variation of this approach is New York State's service contract with the NY Metropolitan Transit Authority which has been capitalized in financial markets (see Box 6.8).

Box 6.7: Example of a Public Service Obligation to Attract Privately-Financed Infrastructure: the Prince Edward Island Bridge in Canada

In October, 1993, a private entity raised $C661.5 million (approximately W400 billion) for construction of a bridge to Prince Edward Island on the Atlantic coast of Canada. The bridge will supplant existing ferry service. The Canadian Government faced substantial immediate costs to overhaul the ferries and continuing escalation in the subsidies required to operate the service. As an alternative, the Government proposed providing an annual subsidy of $C42 million for 35 years, subject to annual inflation adjustment, to any private group that would build and operate a bridge.

The indexed $C42 million was estimated to be the recurring capital and operating cost for the ferries. Experience showed that ferry costs were escalating at rates in excess of the general price index so the Government was willing to commit a fixed sum as a PSO for a long period.

In this example, the subsidy payment is subject to annual appropriation and is not a full faith and credit obligation of the Canadian government. The investors are assuming some political risk, but they had substantial confidence that the Canadian Government would continue to honor its pledge. The private sector project developers will absorb the construction risk for the project, as well as the risk of any future deficits between operating expenses and debt service and income from tolls and the subsidy payments. The bridge is estimated to cost $C840 million and will be transferred to the central government at the end of the 35-year concession period.

The annual subsidy is explicit, permitting it to be capitalized on favorable terms in the financial markets, and stimulating private sector investment to cover the balance of the project cost, as well as assume construction-related risks. The Canadian Government achieved both private sector investment and insulation from future capital and operating losses without having to pledge its full faith and credit. Note however the importance that investors had confidence in the Government's commitment to pay the PSO subsidy for the agreed time period.

Box 6.8: New York State:

In New York City there is a high dependency on mass transportation, however, massive investment has been required to reconstruct facilities that deteriorated over the years. One of the techniques used to raise capital for the initial 5-Year capital plan of investment made in the Metropolitan Transportation Authority's (MTA) facilities and rolling stock was service contract revenue bonds. In 1981, the New York State Legislature permitted the Governor to enter into annual service contracts for $80 million per year for 35 years with the MTA for transit services that would benefit residents of the State of New York. The annual payments were not a debt of the State and are subject to annual appropriation by the Legislature. The Legislature is under no specific obligation to appropriate the funds in support of the service contracts. However, the financial markets believed that the Legislature would not permit a default on securities the MTA issued which capitalized the service contract revenue stream.

The first five-year financial plan anticipated raising about $650 million from the stream of service contract revenues, with the maximum amount of annual debt service equal to the annual service contract payment. The financial markets treated the service contract revenue bonds as "moral obligation" debt of New York State and accorded them a credit rating one level below that of the State's general obligation debt.

6.135 The Korean Government has an opportunity to apply similar approaches to those taken by the Canadian and New York governments in making a public service obligation or service contract payment each year to the KNR in exchange for providing lower-cost passenger and bulk commodity shipping services. These payments would become transparent to future investors and shareholders of KNR and could be valued in the financial markets in capitalizing the value of the railroad's assets. A W100 billion per year contract payment (comparable to recent subsidy payments sought by KNR to offset losses caused by price regulation), could be capitalized to yield W1 trillion in new investment, or further enhance the value of a corporatized KNR.

ANNEXES

ANNEX 1

ESTIMATING CONGESTION CHARGE REVENUES FOR SEOUL

1. In 1985, KHRIS published the results of a study of congestion charges for the Central Business District of Seoul. Within that study three different charging schemes were examined.

(a) An area license scheme applied only to cars

(b) An area license scheme for cars combined with congestion surcharges on taxis

(c) Congestion charges on all road users.

2. That study employed a traffic model for Seoul in which both the decision to make trips and the choice of mode were sensitive to the generalized costs (time and money costs taken together) for all the available alternatives. The study estimated the effect of different charging schemes on traffic flows on the major links in the network, and hence on travel times. Time savings were calculated for those remaining in cars after the introduction of congestion charging. Time differences were also calculated for those changing modes of transport as a consequence of the charge. Where (as was commonly the case) this involved an increased journey time, this was treated as a negative benefit to be deducted in calculating the overall benefit. All time changes were converted into monetary terms using a value of time. The effect of the changes on the operation costs of the public transport modes were also estimated and taken into account. The model was run separately for peak and off peak periods. By comparing the calculated benefits and revenues from congestion charge at different level of charge it was possible to estimate approximately what would be the optimum charge in welfare terms (and what would be the tax revenue associated with it), and also what would be the tax revenue maximizing charges.

3. The conclusions of that study on Seoul were that, for the target year of 1986, a charge of W1,000 on each vehicle crossing the boundary into the CBD during the peak period would yield a gross benefit of W62 billion per annum, and a revenue of nearly W11 billion per annum. For the off peak period the maximum benefit was obtained with a lower charge of W500 per vehicle. These charges were estimated to reduce the flow of cars and taxis at the cordon by 45% at the peak, and by 66% and 55% respectively off peak. The total revenue that would be obtained in Seoul from an application of charges approximating to the welfare optimum, applied both at peak and off peak, would be about W20 billion per annum. All of these values were expressed in 1983 prices.

4. It has not been possible in this present review to rework the model used to make those estimates. But it is possible to make some deductions from it about what might be the broad order of magnitude to be expected if the same model were reworked for current conditions (Table 4-8).

5. The significant changes which have occurred since 1985 would appear to be the following:

(a) All prices have risen so that expression of the expected benefits and tax revenues in 1993 prices would be higher even if nothing else changed (ceteris paribus);

(b) Real incomes have risen. This will have an effect over and above that of the general price increase. It will increase the value of time saved by a congestion charge. It may also increase peoples willingness to pay for the convenience of being in their own car and increase their ability to afford cars - and ancillary equipment - which makes congestion more comfortable. That may tend to cause less diversion from the car as a consequence of any given level of charge, but, at the same time, increases the traffic volume and hence revenue at any given level of charges.

(c) Car ownership and traffic volumes have risen; this will tend to increase the number of vehicles paying the tax, and hence (ceteris paribus) the revenues.

(d) Congestion has increased - particularly at the off peak - which will have the effect of increasing the optimum charge (because the optimum charge is a function of the level of congestion).

(e) An extensive rail metro network is now available, and being expanded. This will tend to lower road traffic volumes (indeed it is one of the main reasons why travel speeds in the CBD have levelled off in recent years). But it will also reduce the time penalty of those who are persuaded to shift from car to public transport as a consequence of the introduction of a charging scheme.

6. These various impacts are roughly brought together in the construction of an estimate of the effect of introducing a congestion charge on revenue for Seoul in 1994. Because of the distinct difference of pattern between peak and off peak traffic volume calculations were made separately for peak and off peak traffic.

7. For the *revenue* estimates, initially a CPI index was used to inflate the original values to 1994 values. The optimal charge has been assumed to be unchanged in real terms for the peak to reflect the stabilized level of peak congestion. But the fact that the peak traffic speed is now very similar to the off peak speed is the basis for assuming that the optimal charge should be the same throughout the day for the CBD cordon. That implies a multiplier of 2 for the off-peak optimal toll. The ratio of the traffic volumes to which these tolls are applied is taken as the ratio of observed current traffic volumes to those of 1984 for the peak period. For the off peak period it was assumed that the effect of the increase in the optimum charge will be to reduce the traffic volume by the same proportion as estimated in the case of peak period charges (varied between W500 and W1000 in the base (1984) example). Thus the multiplier used for traffic growth was the product of the observed volume change and the degenerated traffic ratio (0.78). The estimate revenues for peak and off-peak periods were summed to give the total revenue estimate.

8. The effect of rising real incomes was not incorporated in these estimates. As the willingness to pay for time savings is likely to be closely related to income, use of the CPI inflator was a conservative basis for estimating the potential revenue yield. It is certainly the case that the calculated welfare benefits would increase more in line with real income changes as the value of time - the predominant element if welfare benefits - appears to be closely related to real income.

9. The 1985 study was based on the assumption that congestion was a central business district peak problem only. Since then not only has the level of CBD congestion levelled out at a

Table A-1: Updated Study of Cordon-Based Road Pricing for Seoul
(1994 Won)

	Peak	Off Peak	Total
1985			
Volume (veh/hour)	61,740	30,237	
Regional average speed (kph)	19.44	29.28	
CBD average speed (kph)	14.10	22.15	
Price (won)	1,000	500	
Multipliers			
CPI (1983-1993)	1.66	1.66	
CBD Traffic (1986-1993)	1.00	1.41	
Price (1986-1993)	1.00	2.00	
Factor for price change		0.78	
Revenues (million won)	16,549	39,781	656,330

fairly constant all day level (which has been allowed for in the rough estimate), but congestion has spread rapidly outside the center. In contrast with the traffic growth across the CBD cordon between 1986 and 1993 of 27%, traffic growth on the Han River bridges has been nearly 50%, and that on the outer boundary of the city has been approximately 200%.

10. As illustrated earlier, peak hour congestion is now widespread. In 1993 about two million vehicles crossed the outer boundary, and 1.7 million crossed the Han river bridges daily compared with only 1.4 million crossing the CBD cordon. The modelled effect of the charge on the volume of traffic at the CBD cordon was a reduction of 45%. That magnitude reflects possibilities of transfer to other modes and routes. Assuming that the effect of a charge on traffic volumes would be less at the outer boundary (we assume only 10% reduction), and that a charge of half that for the CBD cordon is imposed, scaling up yields a likely revenue equivalent of about W40 billion per annum. If the peak period charge was applied to traffic throughout the day to reflect the levelling out of traffic a further W40 billion revenue would accrue.

11. In total, the factoring up of cordon charges for the CBD of the city as examined in the 1985 study, and the addition of a charge at half that level for traffic entering the city, suggested an annual revenue of nearly W140 billion per annum at charges still below the economic optimum as calculated.

12. **Estimating cordon charge revenues - a different approach.** An even simpler basis of estimation for cordon charges might be to use recent counts of cordon crossings, and make conservative assumptions about the amount of traffic degeneration or diversion that might occur if

cordon tolls were introduced. It was assumed that charges are levied on inbound vehicles only between 07:00 and 20:00 (recent traffic studies suggest that about 25% of the CBD cordon traffic and 30% of the boundary cordon traffic occurs outside these hours). The estimation deflated total daily traffic to allow for the period of congestion pricing and also assumed that 10% of the vehicles at the CBD cordon and 40% of the vehicles at the external cordon are buses or freight vehicles that would be exempt from charging. The annualization factor was 320 times the calculated daily averages (to allow for holidays, bad weather, etc.). The same diversion factors for the central cordon (where detours for through traffic are more possible) as those estimated in the KHRIS study were used. For the external cordon, a lower diversion of 20% was used. On this basis the estimated toll revenues are shown below for all day tolls at different levels.

Table A-2: Estimated All Day Toll Revenues

	Tolls (won per trip)	**Diversion (%)**	**Revenue (billion won per annum)**
CBD	1666	30	142
Boundary	833	10	92
TOTAL			234

Even this estimate is conservative in a number of ways.

(a) The study assumed only three peak hours per day and ten off-peak hours, with peak hour volumes more than twice the off-peak. Recent traffic studies have indicated peak hour volumes, even for the CBD cordon, only about 40% in excess of inter-peak volumes, with high volumes being experienced from 07:00 through to 24:00.

(b) The 1985 study prices were not completely welfare maximizing, as the peak charge was limited to W1000 on the grounds of political acceptability.

(c) The fact that real incomes have increased substantially over the period means that the willingness to pay will also have increased.

13. It must be emphasized that these are extremely crude but conservative estimates of the revenue generated by a simple charging scheme. Nevertheless, according to the analysis, higher tolls might be appropriate. An estimate of W250 billion per annum as the yield of a simple cordon pricing scheme for Seoul appears reasonable. A similar scheme applied to Pusan might, on the basis of relative city size and traffic flows, could yield anything up to W100 billion per annum.

Korea National Railways

(Billions of Won)

Source: KNR

Year	1986	1987	1988	1989	1990	1991	1992	Forecast 1993
A. Income/Expense								
TOTAL REVENUE	647.4	681.4	753.0	837.0	879.7	1,027.6	1,071.1	1,228.0
Revenue from Operations Without Subsidies	592.2	626.2	672.2	714.2	770.2	934.5	991.8	1,118.5
% User Fee Earned	91.5%	91.9%	89.3%	85.3%	87.6%	90.9%	92.6%	91.1%
% Non-Operating Revenues	2.2%	2.2%	2.3%	2.7%	2.9%	3.2%	4.1%	5.8%
% Non-Operating Gains	1.7%	2.3%	3.9%	6.6%	3.0%	3.1%	3.3%	3.1%
% Government Subsidy	4.6%	3.7%	4.6%	5.4%	6.6%	2.7%	0.0%	0.0%
TOTAL EXPENSES	654.2	685.1	755.9	839.4	881.9	1,029.2	1,151.7	1,227.1
Operating Expense	630.0	664.6	718.9	780.0	858.8	999.5	1,109.0	1,174.5
Labor Expense	216.5	237.3	272.1	323.1	386.8	479.1	609.2	557.7
Operating Expense Less Depreciation	546.0	580.1	630.1	693.9	764.5	901.6	1,003.9	1,055.4
% Ops Expense Depreciation	12.8%	12.3%	11.8%	10.3%	10.7%	9.5%	9.1%	9.7%
% Ops Expense Interest	10.2%	10.4%	9.4%	8.4%	8.0%	6.8%	6.5%	2.7%
Labor as % of Total Revenue Before Subsidies	35.1%	36.2%	37.9%	40.8%	47.1%	47.9%	56.9%	45.4%
Labor as % of Oper. Revenue Before Subsidies	36.6%	37.9%	40.5%	45.2%	50.2%	51.3%	61.4%	49.9%
INCOME								
Income from Operations without Subsidies	(37.8)	(38.5)	(46.8)	(65.9)	(88.5)	(65.0)	(117.2)	(56.0)
Income from Operations with Subsidies	(7.8)	(13.5)	(12.3)	(20.9)	(30.7)	(36.9)	(117.2)	(56.0)
Net Income without Subsidies	(36.8)	(28.7)	(37.3)	(47.3)	(60.0)	(29.7)	(80.5)	0.9
Net Income with Subsidies	(6.8)	(3.7)	(2.8)	(2.4)	(2.1)	(1.5)	(80.5)	0.9
Income from Operations without Depreciation & Subsidies	46.2	46.1	42.1	20.3	5.7	32.9	(12.1)	63.2
Income from Operations without Subsidies & Interest	29.0	32.8	24.0	4.2	(18.4)	4.6	(42.1)	(22.8)
Government Subsidies	30.0	25.0	34.5	45.0	57.9	28.1	0.0	0.0
Depreciation	(84.0)	(84.5)	(88.9)	(86.2)	(94.2)	(97.9)	(105.1)	(119.1)
Interest Paid	66.8	71.2	70.7	70.1	70.1	69.6	75.1	33.1
B. Selected Balance Sheet Items								
Current Assets	50.2	27.1	56.8	71.1	147.9	242.7	295.3	282.7
Current Liabilities	211.4	280.3	294.0	214.3	393.2	599.7	930.5	122.0
Long Term Debt	1,171.4	1,273.1	1,189.2	1,164.7	1,250.6	1,372.8	1,693.7	364.7
Total Assets	3,297.9	3,571.4	3,696.2	3,727.2	4,458.8	4,989.9	5,704.8	5,804.7
Total Liabilities	1,382.8	1,553.4	1,562.4	1,436.0	1,691.5	2,011.2	2,654.5	816.7
ROK Equity = Assets Less Liabilities	1,915.1	2,017.9	2,133.8	2,291.2	2,767.3	2,978.7	3,050.3	4,988.0
Major Equity Sources								
Revaluation Surplus	1,734.7	1,797.5	1,852.6	1,852.6	2,311.9	2,311.9	2,311.9	2,311.9
Donated Surplus & Loan Discharge	305.4	341.2	428.2	608.9	627.9	840.9	993.0	2,929.8
Retained Earnings (Losses)	(195.0)	(190.7)	(217.1)	(240.3)	(242.5)	(244.0)	(324.6)	(323.6)

Korea Highway Corporation

(Billions of Won)

Source: KHC

Year	**1988**	**1989**	**1990**	**1991**	**1992**
A. Income/Expense					
Revenues from Operations	238.7	283.7	348.7	450.6	623.3
Expenses & Administration	92.6	94.2	112.0	143.0	166.3
Income Before Depreciation & Interest & Subsidies	146.1	189.5	236.7	307.6	457.0
Income After Depr & Int, Before Subsidy	12.5	26.5	44.3	160.4	71.4
Income After Depreciation & Interest & Net Subsidy	51.7	91.1	103.2	356.6	135.0
Depreciation	129.0	163.8	194.1	152.5	375.4
Government Subsidies	45.0	80.0	84.1	240.7	98.5
(Taxes Paid to Government)	(5.8)	(15.4)	(25.2)	(44.4)	(35.0)
Interest Paid	7.7	5.1	3.9	3.0	32.2
(Interest Earned)	(3.2)	(5.8)	(5.6)	(8.3)	(22.0)
B. Selected Balance Sheet Items					
1. Current Assets	11.6	79.0	99.9	282.3	160.0
2. Current Liabilities	62.3	168.3	302.1	718.6	776.4
Long Term Debt	53.9	83.3	195.0	650.7	1,359.9
Short Term Obligations	52.2	148.9	275.3	668.3	731.3
TOTAL KHC DEBT	106.1	232.2	470.3	1,319.0	2,091.2
Change in Debt		126.0	238.1	848.7	772.2
Total Assets	761.1	987.7	1,337.9	2,562.1	3,473.9
Total Liabilities	160.7	309.1	563.7	1,540.4	2,330.8
Equity = Assets Less Liabilities *	600.4	678.6	774.2	1,021.7	1,143.2
Major ROK Assets & Equity Sources					
Toll Road Charter	664.8	806.4	1,107.5	2,106.8	3,080.7
Cash Invested	557.9	637.9	722.0	962.6	1,061.1

* ROK has 98.88% of Equity

Short Term Obligations include payables & current portion of L.T. debt.

Korea Maritime & Port Administration

(Billions of Won)

Source: World Bank

						Forecast			
Year	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
A. Income/Expense									
Revenues from Operations	132.4	136.2	136.0	138.5	183.7	206.6	237.1	272.0	312.4
Operating Expenses Before Depreciation	40.3	42.0	55.2	70.9	77.9	84.6	90.7	98.0	106.8
Net Operating Income Before Depreciation	92.1	94.2	80.8	67.6	105.8	122.0	146.4	174.0	205.6
Net Operating Income After Depreciation	64.9	58.3	44.6	26.7	53.3	62.6	80.5	97.1	112.7
Depreciation	(27.2)	(35.8)	(36.3)	(40.9)	(52.6)	(59.4)	(65.9)	(76.9)	(92.9)
Non-Operating Income	11.2	9.7	13.8	18.0	13.1	13.1	13.1	13.1	13.1
Interest Paid (Net)	(11.9)	(12.0)	(12.6)	(13.4)	(12.2)	(10.9)	(10.4)	(10.6)	(10.6)
Other Non-Operating Expense & Losses	(8.4)	(33.4)	(22.6)	(36.0)	(8.2)	(9.0)	(9.8)	(11.1)	(12.8)
Net Income	55.8	22.6	23.1	(4.6)	46.0	55.8	73.4	88.4	102.4
Net Government Subsidy		72.0	141.7	248.0	481.5	587.5	379.8	366.5	513.3
B. Selected Balance Sheet Items									
1. Current Assets	13.5	8.0	4.8	5.5	8.0	13.8	27.2	48.6	67.7
2. Current Liabilities	21.5	33.4	35.4	25.9	41.0	47.5	51.7	47.1	48.6
3. Long Term Debt	122.3	149.5	164.6	156.7	133.4	121.8	120.2	132.3	122.3
Conversions of Private Facilities						59.4	119.3	411.8	643.5
4. Total Equity	1,524.4	2,829.4	3,139.6	3,490.2	4,288.4	5,048.8	5,629.1	6,220.6	7,000.3
Major Sources of ROK Equity									
Revaluation Surplus	183.3	1,353.5	1,353.5	1,353.5	1,614.4	1,722.0	1,839.9	1,969.7	2,127.3
Government Subsidy	286.9	358.9	500.6	748.6	1,230.1	1,817.7	2,197.5	2,564.0	3,077.3
Capital Contributed	331.2	380.0	524.1	641.9	651.8	661.3	670.3	677.1	683.6
Retained Earnings	275.1	289.1	313.5	298.2	344.2	400.0	473.5	561.9	664.3

Korea Container Terminal Authority

(Billions of Won)

Source: World Bank

Year	1991	1992	1993	(Forecast) 1994	1995	1996	1997
A. Income/Expense							
Revenues from Operations	36.1	37.7	40.4	45.7	50.9	53.4	62.1
Operating Expenses Before Depreciation	4.5	5.3	5.4	6.2	7.3	7.7	8.5
Net Operating Income Before Depr & Amortization	31.6	32.4	35.0	39.5	43.5	45.7	53.6
Net Operating Income After Depr & Amortization	16.8	17.8	20.4	24.9	36.2	45.7	48.1
Depreciation & Amort of Port Facility Rights	(14.8)	(14.6)	(14.6)	(14.6)	(7.3)	(0.0)	(5.5)
Non-Operating Income	3.1	6.4	0.5	0.4	0.3	0.6	1.2
Other Non-Operating Expense & Losses	(5.0)	(3.6)	(0.1)	(2.1)	(7.6)	(18.6)	(32.3)
Corporate Tax	(4.8)	(4.2)	(3.3)	(3.4)	(3.9)	(2.4)	(2.3)
Net Income	10.2	16.3	17.5	19.8	25.0	25.3	14.8
B. Selected Balance Sheet Items							
1. Current Assets	47.8	35.8	13.7	29.0	47.2	80.4	139.6
2. Current Liabilities	14.5	11.1	11.2	12.3	16.4	56.8	66.1
3. Long Term Debt	77.5	69.6	73.4	124.4	197.6	281.1	369.9
4. Total Equity	12.3	28.3	44.1	62.2	85.2	108.0	120.2
Major Sources of ROK Equity/Major Assets							
Construction in Progress	2.5	34.4	90.7	141.4	236.2	197.2	0.0
Port, Building & ICD Use Rights	50.8	37.0	22.4	27.2	18.9	181.1	439.2
Retained Earnings	10.2	17.0	17.5	19.8	25.0	25.3	14.8

Korea Airports Authority

(Billions of Won)

Source: KAA

	1989	1990	1991	1992	1993
Operating Revenues	66.6	89.3	106.2	134.2	169.9
Operating Expense Before Depreciation & Taxes Paid	45.0	53.6	69.6	83.1	97.6
Net Operating Income	21.7	35.7	36.5	51.1	72.3
Non-Operating Income (Primarily interest earned)	4.2	7.8	10.9	13.4	14.3
Depreciation *	(8.4)	(10.4)	(13.7)	(31.8)	(41.5)
Corporation Tax Paid to Government	(3.5)	(7.7)	(8.0)	(5.1)	(6.6)
Investment in NSMA Project	0.0	0.0	0.0	(11.7)	(23.0)
Income Before Other Special Items	14.0	25.4	25.8	15.9	15.5

* Only KAA investments amortized, not MOT-funded assets.
No interest expense reported.

Pusan Urban Transit Authority (PUTA)

(Billions of Won)

Source: World Bank

						Forecast						
	Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Net Income		(119.0)	(76.2)	(66.7)	(73.4)	(99.4)	(140.2)	(174.9)	(263.0)	(230.7)	(244.1)	(241.2)
Total Internally-Generated Sources of Funds		(18.5)	17.4	16.0	6.5	13.6	22.7	33.0	42.9	93.0	116.1	140.3
Capital Projects		10.2	53.4	84.0	223.0	426.6	646.9	500.3	299.5	16.9	79.6	83.6
Interest		64.3	64.3	64.4	47.5	94.4	142.1	189.6	223.2	239.8	275.0	290.2
Principal		166.7	76.5	53.4	70.5	97.6	271.5	183.0	193.2	272.9	396.3	782.4
Borrowing (1990 is debt outstanding)		265.3	134.7	131.6	250.0	348.3	787.5	566.7	467.1	308.6	527.3	906.2
	Outstanding Debt	***265.3***	***323.5***	***401.7***	***581.2***	***831.9***	***1,347.9***	***1,731.6***	***2,005.5***	***2,041.2***	***2,172.2***	***2,295.9***
Government Equity												
Central Government		29.6	20.0	40.0	60.0	166.7	221.7	185.1	194.9	64.2	79.9	80.9
City of Pusan		4.0	5.0	20.0	30.0	60.0	65.0	70.0	68.0	60.0	60.0	60.0

Seoul Subway Corporation

(Billions of Won)

Source: Seoul Subway Corporation

Year	1988	1989	1989	1990	1991	1992	1993
Operating Revenue	136.6	155.1	175.2	200.9	259.7	283.2	338.1
Operating Expense	152.5	179.2	204.9	217.1	270.3	304.7	343.3
	(15.9)	(24.1)	(29.7)	(16.2)	(10.6)	(21.5)	(5.1)
Other Sales & Operating Expense	10.4	13.6	16.8	16.7	23.8	25.9	25.8
Net Operating Income	(26.3)	(37.7)	(46.6)	(33.0)	(34.3)	(47.4)	(31.0)
Depreciation	62.4	62.6	65.8	68.9	74.0	81.2	
Operating Cash Flow	36.1	24.9	19.3	35.9	39.6	33.8	
Non-Operating Revenue							
Rents	1.6	1.6	2.4	3.8	4.2	4.3	4.7
Interest Earnings	0.5	1.4	2.9	7.8	13.1	11.5	13.5
Other (primarily foreign exchange-related)	39.7	29.0	61.5	21.5	22.1	31.4	1.4
Subtotal - Non-Operating Income	41.8	31.9	66.8	33.1	39.3	47.1	19.6
Non-Operating Expense							
Interest Paid	166.9	161.2	154.9	150.7	139.9	131.7	134.7
Other (primarily foreign exchange-related)	83.1	19.1	19.9	62.9	51.3	20.7	24.6
Subtotal - Non-Operating Expense	250.0	180.2	174.8	213.6	191.2	152.4	159.3
Net Non-Operating Income	(208.2)	(148.3)	(108.0)	(180.5)	(151.9)	(105.2)	(139.7)
Ordinary Income - Before Special Items & Tax	(234.5)	(186.0)	(154.6)	(213.5)	(186.3)	(152.6)	(170.7)
Corporate Tax	0.0	0.1	0.1	0.2	0.0	0.0	0.1
Balance Sheet Items							
Fixed Assets - Land, Subways & Rolling Stock	2,253.1	2,221.5	2,235.4	2,279.4	2,358.1	2,401.4	2,491.4
Current Liabilities	440.7	409.1	379.0	323.0	474.9	397.0	463.3
Long Term Liabilities	1,758.4	1,752.4	1,815.9	2,002.9	1,987.2	2,104.3	2,232.4
	2,199.1	2,161.5	2,194.8	2,325.9	2,462.1	2,501.4	2,695.7
Retained Earnings (Losses)	(733.5)	(966.1)	(1,070.2)	(1,282.7)	(1,469.4)	(1,626.4)	(1,793.0)
Total Assets/Total Liabilities	2,357.3	2,320.8	2,349.1	2,436.7	2,545.4	2,577.6	2,745.3

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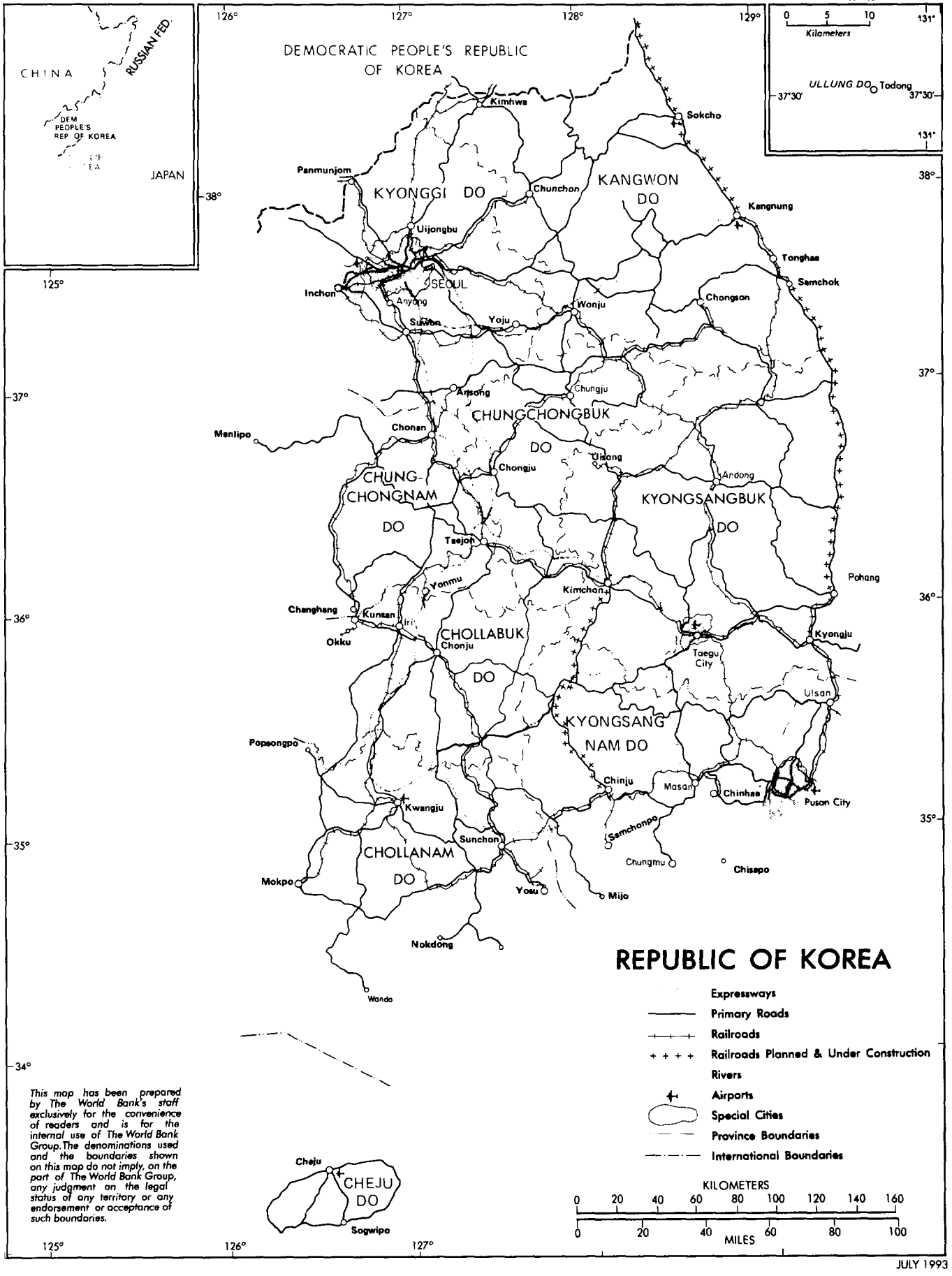

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JULY 1993